Canon LENS TECHNICAL REPORT VOL.4

CANON INC.
LENS PRODUCTS DEVELOPMENT CENTER

This Technical Report describes the new closeup accessories designed for the EOS cameras. With the current boom in nature photography, more users want to photograph flowers, insects, and other nature subjects at high magnifications. Although a macro lens is most ideal for closeup photography, a simple accessory enabling convenient closeup photography would attract more users into this field.
Based upon this premise, Canon has developed closeup lenses 500, 250D, and 500D and extension tube EF12 to make the closeup system for EOS cameras more complete.

Convenient Closeup Accessories

Closeup Lenses 500, 250Dand 500D and Extension Tube EF12

Photo 1: From the left, closeup lenses 250D (58mm dia.), 500D (77mm dia.), and 500 (77mm dia.)

Photo 2: Extension tube EF12

●Closeup lenses 500, 250D, and 500D

These closeup lenses are screwed on to the front of an EF lens just like a filter. Closeup lens 500 is geared for newcomers to closeup photography, while closeup lenses 250D and 500D are for users who want higher image quality.
For the FD lenses, closeup lenses 500T (dedicated to the FD80-200mm f/4L lens), 240, and 450 are already available. Now for the EF lenses, the low-cost closeup lens 500 and top-notch closeup lenses 250D and 500D are available. The 500 and 500D come in four sizes (52, 58, 72, and 77 mm) and the 250D come in two sizes (52 and 58 mm).
All the closeup lenses have super spectra coatings to prevent shifts in the color balance of the prime lens.

●Extension tube EF12

Extension tube EF12 is installed between the EF lens and the camera body, thereby enabling closeup photography. Almost all EF lenses can be attached to the EF12. Being 12 mm long, it is about half the length of extension tube EF25. The EF25 and EF12 offer a wide magnification range for closeup photography.

Closeup Lens and Extension Tube Principles

Closeup photography accessories include macro lenses, bellows, and macro photo lenses. Just by attaching a closeup lens or an extension tube to an EF lens, closeup photography can be enjoyed in the same way as with a macro lens.o Closeup lens principle

When the prime lens is focused at infinity, the incident light rays become parallel. The light rays from the closeup lens' object point passing through the closeup lens also become parallel. Therefore, by attaching a converging closeup lens to the front of a prime lens, closeup photography is enabled. (The "250" and "500" designations of the closeup lenses refer to the focal length [mm] shown in the figure.) Also, when the prime lens is focused at its minimum focusing distance, a higher magnification is achieved.

Fig. 1 Light rays passing through a closeup lens.

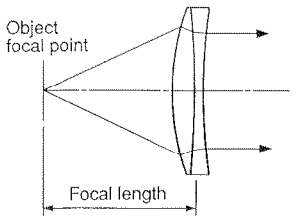
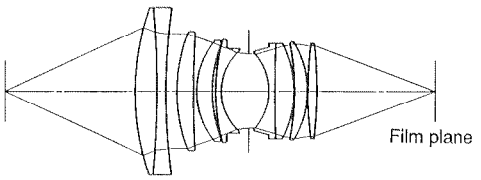


Fig. 2 EF 50mm f/1.4 USM lens with closeup lens 250D attached.



When the prime lens is focused at infinity, the closeup lens' object point is where sharp focus is achieved.
(In the above figures, the light rays are not drawn to scale.)

Extension tube principle

Extension tube EF12 is a fixed-length tube equipped with a lens mount and electrical contacts. It has no lenses. When the tube is installed between the camera and lens, the lens' is extended according to the tube's length. The minimum focusing distance is thereby shortened, resulting in a higher magnification. Also, the shorter the focal length of the lens, the higher the magnification will be when it is attached to an extension tube. In the case of the EF 35mm f/2 lens, its maximum magnification will increase from 0.23X to 0.58X when the EF12 is attached. See Photos 3 and 4.

Selecting a Prime Lens

For closeup lenses 500, 250D, and 500D

Prime lenses are designed to minimize inherent aberrations. If a supplementary lens such as a closeup lens is attached to a prime lens, the aberrations will become more pronounced. To minimize aberrations, lenses with a focal length ranging from 50mm to 135mm are recommended as the prime lens for closeup lens 250D. For closeup lenses 500 and 500D, prime lenses with a focal length ranging from 70mm to 350mm are recommended. Sample combinations are shown as follows:

- EF 50mm f/1.4 USM lens with closeup lens 250D, 500, or 500D.
- EF 35-80mm f/4-5.6 USM zoom lens with closeup lens 250D or 500D.
- EF 70-210mm f/3.5-4.5 USM zoom lens with closeup lens 500 or 500D.

Also, with a fixed-length zoom lens such as the EF 70-200mm f/2.8L USM as the prime lens, the image magnification can be changed by zooming while maintaining the same point of focus.

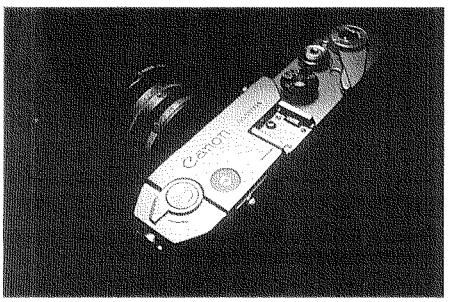


Photo 3: Taken at the minimum focusing distance with the EF 35mm f/2 lens. (0.23X magnification)

Photo 4: Taken at the minimum focusing distance with t he EF 35mm f/2 lens attached to extension tube EF12. (0.58X magnification)

Extension tube EF12

This extension tube extends the distance between the lens and film. The shorter the focal length of the lens, the higher the image magnification will be. In effect, the working distance* (between the front of the lens and the subject) becomes shorter. Also, if a zoom lens is used, a zooming operation will change the image magnification and point of focus at the same time. Therefore, it is easier to use the extension tube with a single focal length lens.

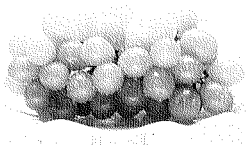
*To be described later.

For Better Results

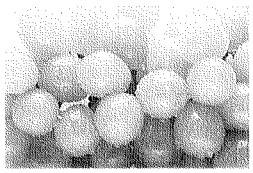
The closeup lenses and extension tube can be easily attached to an EF lens. The picture-taking operation is identical to when an EF lens is used alone. Understanding the closeup accessory's possibilities will result in better closeup photographs. A few closeup picture-taking hints are described below.

Using the maximum magnification

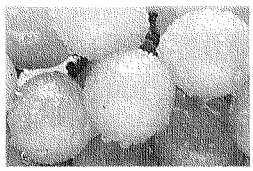
To attain maximum magnification, turn the prime lens' focusing ring to the minimum focusing distance. To focus the subject, move the camera forward or back. For an intermediate magnification, set the prime lens' focusing ring to a longer focusing distance. To focus the subject, move the camera forward or back. If you try to focus the subject by adjusting the distance between the prime lens and film plane, the magnification will also change, making it difficult to compose the shot. Using a sturdy tripod with a focusing stage allowing the camera to move forward or back is recommended.



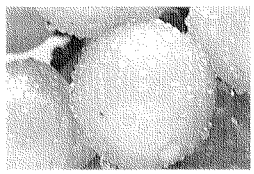
0.15x
- EF 400mm f/5.6 USM + Extension tube EF12
- EF 100-300mm f/4.5-5.6 USM + Extension tube EF12



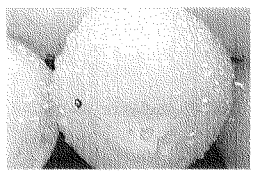
0.25x
- EF 85mm f/1.8 USM + Extension tube EF12
- EF 70-210mm f/3.5-4.5 USM + Extension tube EF12



0.5x
- EF 50mm f/2.5 compact macro lens
- EF 80-200mm f/2.8L +Closeup lens 500/500D



0.75x
- EF 50mm f/2.5 compact macro + Extension tube EF12
- EF 75-300mm f/4-5.6 USM + Closeup lens 500/500D



1.0x
- EF 100mm f/2.8 macro
- EF 80-200mm f/4.5-5.6 USM + Closeup lens 250D

Extension tubes effective with super telephoto lenses

Since the super telephoto L lenses have a large front element, closeup lenses are too small to be attached. An extension tube is therefore used for closeup photography with such lenses. Although super telephoto EF lenses are often used for portraiture, their maximum magnification is low. (The EF 200mm f/1.8 USM and EF 300mm f/2.8L USM lenses have a magnification of 0.09X and 0.11X respectively.) At such magnifications, the angle of view permits head-and-shoulders shots at most in portraiture. However, when extension tube EF12 is attached to increase the magnification, the face can fill the entire frame. For example, with the extension tube EF12 attached to the EF 300mm f/2.8L USM lens, the maximum magnification is increased from 0.11X to 0.21X. See Photos 5 and 6.

Working distance

An adequate working distance (distance between the subject and the front of the lens) is required for photographing insects which may fly or run away when approached or when artificial light must be used. The prime lens and closeup accessory must be properly matched to allow an adequate working distance when you cannot get very close to the subject. With closeup lenses 250D and 500/500D, the working distance is 0.25 m and 0.5 m respectively. With the extension tube attached to a telephoto lens, the working distance can be 0.5 m or longer.

Working distances with the extension tube EF12 attached:

- EF 100mm f/2 USM: Approx. 0.4 m to 0.8 m
- EF 135mm f/2.8: Approx. 0.7 m to 1.6 m
- EF 35-105mm f/4.5-5.6 USM: Approx. 0.4 m to 1 m
- EF 70-210mm f/3.5-4.5 USM: Approx. 0.3 m to 3.6 m

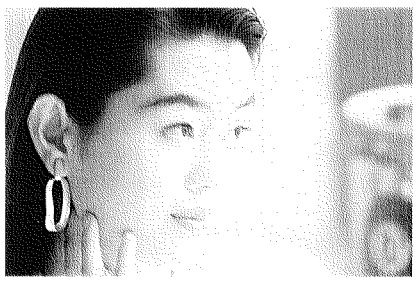


Photo 5: Taken with the EF 300mm f/2.8L USM lens (Min. focusing distance of 3m and magnification of 0.11X.)

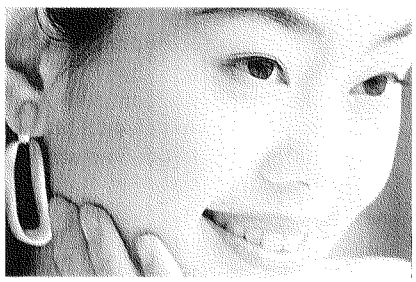


Photo 6: Taken with the EF 300mm f/2.8L USM lens attached to the EF12. (Min. focusing distance of 1.9m and magnification of 0.21X.)

Stop Down for Better Image Quality

When a closeup lens or extension tube is attached, aberrations will increase. As a corrective measure, stop down the aperture to obtain high-resolution, and high-contrast photographs. To improve image quality, an aperture of f/5.6 to f/8 is recommended. (For an explanation of how stopping down the aperture corrects aberrations, see Technical Report Vol. 3.)

Closeup lenses 250D and 500D consist of two elements: a converging lens element and diverging lens element. Such "color-canceling elements" serve to correct chromatic aberrations. Thus, these two closeup lenses are recommended for users who want high image quality in their closeup photos. (For an explanation of how chromatic aberrations affect the image quality, see Technical Report Vol. 3.)

Photo 7: Image taken at maximum aperture with closeup lens 250D attached to the EF 50mm f/1.4USM lens.

Photo 8: Image taken at f/8 with closeup lens 250D attached to the EF 50mm f/1.4 USM lens.

Q & A

On closeup lenses

Q1: How about stacking two or more closeup lenses on a prime lens?

A1: This is not recommended since it may degrade the image quality and cause vignetting with certain prime lenses.

Q2: Can a filter be attached to the front of the closeup lens?

A2: Attaching one filter is okay.

Q3: Are there any lenses which are not compatible with a closeup lens?

A3: Refer to the table on the right.

Q4: Is any exposure compensation necessary for TTL metering?

A4: No. Autoexposure can be used as usual.

Q5: Will the exposure reading be correct in all the metering modes?

A5: Yes.

Q6: Is autofocusing possible?

A6: With certain lenses, proper autofocusing cannot be done. In such cases, focus manually.

Incompatible Lenses	Reason
EF20mm f/2.8 USM	Vignetting will occur at infinity.
TS-E24mm f/3.5L	Vignetting will occur when the lens is tilted or shifted.
TS-E45mm f/2.8	
TS-E90mm f/2.8	
EF20-35mm f/2.8L	Vignetting will occur at the wide angles.
EF20-35mm f/3.5-4.5 USM	
EF28-70mm f/2.8L USM	
EF28-80mm f/3.5-5.6II USM	
EF28-105mm f/4.5-5.6 USM	
EF35-350mm f/3.5-5.6L USM	
EF14mm f/2.8L USM	Unattachable to the front of these lenses.
EF15mm f/2.8FE	
EF200mm f/1.8L USM	
EF300mm f/2.8L USM	
EF400mm f/2.8L USM	
EF500mm f/4.5L USM	
EF600mm f/4L USM	
EF1200mm f/5.6L USM	

On extension tube EF12

Q1: How about connecting two or more extension tubes in tandem?

A1: This is not recommended since it may degrade the image quality and cause vignetting with certain lenses.

Q2: Is any exposure compensation necessary for TTL metering?

A2: If the EF 50mm f/1.4 USM, EF 50mm f/1.8II, or EF 85mm f/1.2L USM is used as the prime lens and the camera is an EOS-5 attached to extension tube EF12, set the exposure compensation on the camera to +1/2 stop.

Q3: Are there any lenses which are not compatible with the extension tube?

A3: If the extension tube is attached to the EF 14mm f/2.8L USM lens or EF 15mm f/2.8 fisheye lens, the point of focus will be within the optical system or near the front of the lens. Also, attaching the extension tube to the EF 50mm f/1.0L USM lens will cause vignetting. Thus, the EF12 should not be attached to these lenses. Also note that vignetting may occur with TS-E lenses when they are shifted.

Q4: Will the exposure reading be correct in all the metering modes?

A4: In the case of spotmetering, the correct exposure reading will not be obtained.

Supplement: Extension Tube EF25

For your reference, information on the existing extension tube EF25 is presented here.

Application

As with the extension tube EF12, the extension tube EF25 is attached to a prime lens and mounted on a camera. The maximum magnification and focusing are achieved in the same way as with the extension tube EF12.

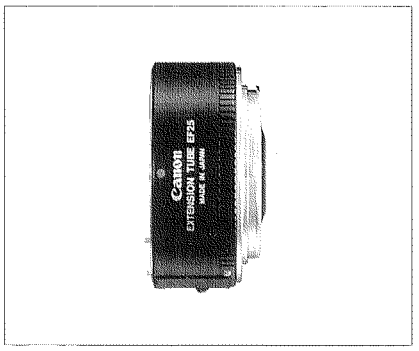


Photo 9: Extension tube EF25

Cautionary Notes

Basically the same as for the extension tube EF12. To improve image quality, stop down the prime lens to f/5.6 to f/8.

Extension tube EF25 Q & A

Q1: How about connecting two or more extension tubes in tandem?

A1: This is not recommended since it may degrade the image quality and cause vignetting with certain lenses.

Q2: Is any exposure compensation necessary for TTL metering?

A2: Refer to the adjacent table. The lenses listed require the exposure compensation (on the camera) indicated.

Compensatable lenses	Exposure compensation (EV)	
	EOS-1N	EOS-5
EF50mm f/1.4 USM	0	+1/2
EF50mm f/1.8 II	0	+1/2
EF85mm f/1.2L USM	+1	+1

Q3: Are there any lenses which are not compatible with the extension tube?

Incompatible Lenses	Reason
EF14mm f/2.8L USM	The point of focus will fall within the optical system.
EF15mm f/2.8 FE	
EF20mm f/2.8 USM	
EF50mm f/1.0L USM	Vignetting will occur.
TS-E45mm f/2.8	Image degradation will be substantial.
TS-E24mm f/3.5L	Vignetting will occur when the lens is shifted.
TS-E90mm f/2.8	
EF20-35mm f/2.8L	At wide angles, the point of focus will be within the optical system. (Zoom lenses with other focal length ranges can be used.)
EF20-35mm f/3.5-4.5 USM	

A3: Refer to the table below.

Q4: Will the exposure reading be correct in all the metering modes?

A4: In the case of spotmetering, the correct exposure reading will not be obtained.

Dimensions and WeightCloseup Lenses 500, 250D, and 500D/Extension Tube EF25

Closeup Lenses 500, 250D, and 500D

Lens	Size	52	58	72	77
500	Max. Diameter	φ54	φ60	φ75	φ80
	mm(inch)	(φ2-1/8)	(φ2-3/8)	(φ2-15/16)	(φ3-1/8)
	Length (mm)	5.7	6.8	7.3	8.3
	mm (inch)	(3/16)	(1/4)	(5/16)	(3/8)
	Weight	16	24	43	44
	g (onz)	(0.6)	(0.8)	(1.5)	(1.5)
250D	Max. Diameter	φ54	φ60		
	mm(inch)	(φ2-1/8)	(φ2-3/8)		
	Length (mm)	10.2	12		
	mm (inch)	(3/8)	(7/16)		
	Weight	55	80		
	g (onz)	(1.9)	(2.8)		
500D	Max. Diameter	φ54	φ60	φ75	φ80
	mm (inch)	(φ2-1/8)	(φ2-3/8)	(φ2-15/16)	(φ3-1/8)
	Length (mm)	9.8	10.5	12.7	13.5
	mm (inch)	(3/8)	(3/8)	(1/2)	(9/16)
	Weight	40	60	120	145
	g (onz)	(1.4)	(2.1)	(4.2)	(5.1)

Extension Tube EF12

Max. Diameter	φ66.5
mm(inch)	(φ2-5/8)
Length	12.3
mm(inch)	(1/2)
Weight	66
g (onz)	(2.3)

Extension Tube EF25

Max. Diameter	φ67.6
mm(inch)	(φ2-11/16)
Length	27.3
mm(inch)	(1-1/16)
Weight	125
g (onz)	(4.4)

Closeup Lenses 500, 250D, and 500D, magnification

Lens	Size	Close-up lenses 250D Magnification (X)	Close-up lenses 500/500D Magnification (X)
EF14mm f/2.8L USM		Not Available	
Fish-eye 15mm f/2.8		Not Available	
EF20mm f/2.8 USM	72	—	0.17~0.04
EF24mm f/2.8	58	0.25~0.10	0.20~0.05
EF28mm f/2.8	52	0.24~0.12	0.19~0.06
EF35mm f/2	52	0.36~0.14	0.30~0.07
EF50mm f/1.0L USM	72	—	0.24~0.10
EF50mm f/1.4 USM	58	0.35~0.21	0.25~0.10
EF50mm f/1.8II	52	0.36~0.20	0.25~0.10
EF50mm f/2.5 Compact-macro	52	0.68~0.20	0.59~0.10
EF85mm f/1.2L USM	72	—	0.28~0.17
EF85mm f/1.8 USM	58	0.50~0.34	0.31~0.17
EF100mm f/2 USM	58	0.57~0.40	0.35~0.20
EF100mm f/2.8 Macro	52	1.41~0.41	1.21~0.20
EF135mm f/2.8	52	0.70~0.55	0.41~0.27
EF200mm f/1.8L USM		Not Available	
EF200mm f/2.8L USM	72	—	0.57~0.39
EF300mm f/2.8L USM		Not Available	
EF300mm f/4L USM	77	—	0.70~0.59
EF400mm f/2.8L USM		Not Available	
EF400mm f/5.6L USM	77	—	0.91~0.78
EF500mm f/4.5L USM		Not Available	
EF600mm f/4L USM		Not Available	
EF1200mm f/5.6L USM		Not Available	
TS-E24mm f/3.5L	72	—	0.19~0.05
TS-E45mm f/2.8	72	—	0.25~0.09
TS-E90mm f/2.8	58	0.69~0.36	0.49~0.18

Lens	Size	Close-up lenses 250D Magnification (X)		Close-up lenses 500/500D Magnification (X)	
		WIDE	TELE	WIDE	TELE
EF20-35mm f/2.8L	72	—		Vignetting	0.15~0.07
EF20-35mm f/3.5-4.5 USM	77	—		Vignetting	0.19~0.07
EF28-70mm f/2.8L USM	77	—		Vignetting	0.30~0.14
EF28-80mm f/3.5-5.6II USM	58	Vignetting	0.51~0.31	Vignetting	0.38~0.15
EF28-105mm f/3.5-4.5 USM	58	Vignetting	0.43~0.41	Vignetting	0.30~0.20
EF35-80mm f/4-5.6III	52	0.23~0.15	0.49~0.31	0.17~0.07	0.36~0.15
EF35-80mm f/4-5.6 USM	52	0.24~0.15	0.50~0.31	0.18~0.07	0.37~0.15
EF35-105mm f/4.5-5.6 USM	58	0.21~0.15	0.60~0.41	0.13~0.07	0.37~0.20
EF35-135mm f/4.5-5.6USM	58	0.18~0.15	0.54~0.50	0.12~0.07	0.32~0.26
EF35-350mm f/3.5-5.6L USM	72	—		Vignetting	0.70~0.68
EF70-200mm f/2.8L USM	77	—		0.21~0.14	0.55~0.39
EF70-210mm f/3.5-4.5 USM	58	0.34~0.29	0.85~0.83	0.20~0.14	0.51~0.41
EF75-300mm f/4-5.6II USM	58	0.41~0.32	1.54~1.18	0.23~0.15	0.89~0.58
EF80-200mm f/4.5-5.6II	52	0.43~0.34	0.99~0.78	0.24~0.17	0.57~0.38
EF100-300mm f/5.6L	58	0.55~0.41	1.59~1.20	0.31~0.20	0.92~0.59
EF100-300mm f/4.5-5.6 USM	58	0.48~0.42	1.22~1.19	0.28~0.21	0.70~0.58

Extension Tube EF12, magnification,focusing distance ranges and working distance ranges

Lens	Magnification (X)	Focusing distance ranges mm (inch)	Woking distance ranges mm (inch)
EF14mm f/2.8L USM		Not Available	
Fish-eye 15mm f/2.8	0.94~0.80	112~119 (4-11/16~4-7/16)	2~5 (1/16~3/16)
EF20mm f/2.8 USM	0.72~0.60	138~141 (5-7/16~5-9/16)	12~16 (1/2~5/8)
EF24mm f/2.8	0.64~0.50	138~142 (5-7/16~5-9/16)	34~39 (1-5/16~1-9/16)
EF28mm f/2.8	0.56~0.43	147~159 (5-13/16~6-1/4)	46~62 (1-13/16~2-7/16)
EF35mm f/2	0.58~0.35	169~201 (6-5/8~7-15/16)	63~104 (2-1/2~4-1/16)
EF50mm f/1.0L USM		Not Available	
EF50mm f/1.4 USM	0.39~0.24	247~323 (9-3/4~12-11/16)	142~226 (5-9/16~8-7/8)
EF50mm f/1.8II	0.39~0.24	249~324 (9-13/16~12-3/4)	156~239 (6-1/8~9-7/16)
EF50mm f/2.5 Compact-macro	0.74~0.24	208~321 (8-3/16~12-5/8)	92~230 (3-5/8~9-1/16)
EF85mm f/1.2L USM	0.25~0.15	497~699 (19-9/16~27-1/2)	346~560 (13-5/8~22-1/16)
EF85mm f/1.8 USM	0.27~0.15	498~723 (19-5/8~28-11/16)	375~605 (14-3/4~23-13/16)
EF100mm f/2 USM	0.27~0.13	573~956 (22-9/16~37-5/8)	445~829 (17-1/2~32-5/8)
EF100mm f/2.8 Macro	1.17~0.12	309~1024 (12-3/16~40-5/16)	134~896 (5-5/16)
EF135mm f/2.8	0.22~0.09	862~1735 (33-15/16~68-5/16)	715~1588 (28-3/16~62-1/2)
EF200mm f/1.8L USM	0.15~0.06	1585~3353 (62-3/8~132-1/16)	1336~3104 (52-5/8~122-3/16)
EF200mm f/2.8L USM	0.23~0.06	1169~3482 (46-1/16~137-1/16)	978~3291 (38-1/2~129-9/16)
EF300mm f/2.8L USM	0.16~0.04	2324~7607 (91-1/2~299-1/2)	2038~7322 (80-1/4~288-1/4)
EF300mm f/4L USM	0.18~0.04	1986~7786 (78-3/16~306-9/16)	1726~7526 (67-15/16~296-5/16)
EF400mm f/2.8L USM	0.15~0.03	3293~13837 (129-5/8~544-3/4)	2914~13457 (114-3/4~529-13/16)
EF400mm f/5.6L USM	0.16~0.03	2893~13449 (113-7/8~529-1/2)	2583~13138 (101-11/16~517-1/4)
EF500mm f/4.5L USM	0.14~0.03	4199~21363 (165-5/16~841-1/16)	3768~20932 (148-3/8~824-1/8)
EF600mm f/4L USM	0.13~0.02	5111~29571 (201-1/4~1164-3/16)	4627~29087 (182-3/16~1145-3/16)
EF1200mm f/5.6L USM	0.12~0.01	10974~113572 (432-1/16~4471-5/16)	10139~112740 (399-3/16~4438-9/16)
TS-E24mm f/3.5L	0.62~0.49	171~179 (6-3/4~7-1/16)	29~37 (1-3/16~1-7/16)
TS-E45mm f/2.8	0.44~0.27	239~299 (9-7/16~11-3/4)	94~153 (3-11/16~6-1/16)
TS-E90mm f/2.8	0.43~0.14	415~817 (16-5/16~32-3/16)	264~691 (10-3/8~27-3/16)

Lens	Magnification (X)		Focusing distance ranges mm (inch)		Working distance ranges mm (inch)	
	WIDE	TELE	WIDE	TELE	WIDE	TELE
EF20-35mm f/2.8L	0.66~0.60	0.46~0.36	157~161 (6-3/16~6-3/8)	201~226 (7-15/16~8-7/8)	13~17 (1/2~11/16)	63~87 (2-1/2~3-7/16)
EF20-35mm f/3.5-4.5 USM	0.70~0.60	0.53~0.36	135~141 (5-5/16~5-9/16)	177~212 (6-15/16~8-3/8)	11~17 (7/16~11/16)	53~89 (2-1/16~3-1/2)
EF28-70mm f/2.8L USM	0.52~0.42	0.39~0.18	222~235 (8-3/4~9-1/4)	336~566 (13-1/4~22-5/16)	28~41 (1-1/8~1/5/8)	165~394 (6-1/2~15-1/2)
EF28-80mm f/3.5-5.6II USM	0.57~0.42	0.47~0.16	172~192 (6-3/4~7-9/16)	291~664 (11-7/16~26-1/8)	33~60 (1-5/16~2-3/8)	152~532 (6~20-15/16)
EF28-105mm f/3.5-4.5 USM	0.53~0.42	0.36~0.12	166~183 (6-9/16~7-3/16)	322~1033 (12-11/16~40-11/16)	36~54 (1-7/16~2-1/8)	165~876 (6-1/2~34-1/2)
EF35-80mm f/4-5.6III	0.50~0.34	0.44~0.16	183~225 (7-3/16~8-7/8)	292~668 (11-1/2~26-5/16)	58~92 (2-5/16~3-5/8)	166~534 (6-9/16~21-1/16)
EF35-80mm f/4-5.6 USM	0.51~0.34	0.46~0.16	182~226 (7-3/16~8-7/8)	285~669 (11-1/4~26-5/16)	56~106 (2-3/16~4-3/16)	158~550 (6-1/4~21-5/8)
EF35-105mm f/4.5-5.6 USM	0.36~0.34	0.28~0.12	221~225 (8-11/16~8-7/8)	580~1080 (22-13/16~42-1/2)	100~103 (3-15/16~4-1/16)	439~945 (17-5/16~37-3/16)
EF35-135mm f/4.5-5.6USM	0.42~0.34	0.29~0.10	208~234 (8-3/16~9-3/16)	478~1675 (18-13/16~65-15/16)	67~93 (2-5/8~3-11/16)	311~1509 (12-1/4~59-7/16)
EF35-350mm f/3.5-5.6L USM	0.43~0.34	0.19~0.04	268~294 (10-9/16~11-9/16)	1779~10146 (70-1/16~399-7/16)	46~72 (1-13/16~2-13/16)	1482~9849 (58-3/8~387-3/4)
EF70-200mm f/2.8L USM	0.22~0.17	0.22~0.06	553~622 (21-3/4~24-1/2)	1161~3392 (45-11/16~133-9/16)	306~375 (12-1/16~14-3/4)	914~3145 (36~123-13/16)
EF70-210mm f/3.5-4.5 USM	0.25~0.17	0.25~0.06	467~615 (18-3/8~24-3/16)	929~3841 (36-9/16~151-1/4)	293~441 (11-9/16~17-3/8)	707~3619 (27-13/16~142-1/2)
EF75-300mm f/4-5.6II USM	0.21~0.16	0.31~0.04	611~699 (24-1/16~27-1/2)	1357~7694 (54-1/8~302-15/16)	421~522 (16-9/16~20-9/16)	1112~7461 (43-13/16~293-3/4)
EF80-200mm f/4.5-5.6II	0.21~0.15	0.23~0.06	619~774 (24-3/8~30-1/2)	1172~3523 (46-1/8~138-11/16)	482~645 (19~25-3/8)	997~3355 (39-1/4~132-1/8)
EF100-300mm f/5.6L	0.21~0.12	0.32~0.04	823~1105 (32-3/8~43-1/2)	1368~7845 (53-7/8~308-7/8)	585~883 (23-1/16~34-3/4)	1102~7596 (43-3/8~298-15/16)
EF100-300mm f/4.5-5.6 USM	0.21~0.12	0.26~0.04	720~1140 (28-3/8~44-7/8)	1278~7847 (50-5/16~308-15/16)	546~959 (21-1/2~37-3/4)	1055~7624 (41-9/16~300-3/16)

Extension Tube EF25, magnification,focusing distance ranges and working distance ranges

Lens	Magnification (X)	Focusing distance ranges mm (inch)	Working distance ranges mm (inch)
EF14mm f/2.8L USM		Not Available	
Fish-eye 15mm f/2.8		Not Available	
EF20mm f/2.8 USM		Not Available	
EF24mm f/2.8	1.22~1.11	131~133 (5-1/8~5-1/4)	12~15 (1/2~9/16)
EF28mm f/2.8	1.09~0.95	137.7~137.9 (5-7/16~5-7/16)	22~25 (7/8~1)
EF35mm f/2	1.00~0.77	158~160 (6-1/4~6-5/16)	37~48 (1-1/2~1-7/8)
EF50mm f/1.0L USM		Not Available	
EF50mm f/1.4 USM	0.68~0.53	200~220 (7-7/8~8-11/16)	82~110 (3-1/4~4-5/16)
EF50mm f/1.8II	0.68~0.53	207~221 (8-1/8~8-11/16)	99~120 (3-7/8~4-3/4)
EF50mm f/2.5 Compact-macro	1.04~0.54	203~223 (8~8-3/4)	72~117 (2-13/16~4-5/8)
EF85mm f/1.2L USM	0.42~0.33	369~409 (14-1/2~16)	203~253 (8~10)
EF85mm f/1.8 USM	0.44~0.32	386~428 (15-3/16~16-7/8)	249~291 (9-13/16~11-1/2)
EF100mm f/2 USM	0.42~0.28	425~543 (16-3/4~21-3/8)	309~401 (12-3/16~15-13/16)
EF100mm f/2.8 Macro	1.38~0.27	314~593 (12-3/8~23-3/8)	101~426 (4~16-3/4)
EF135mm f/2.8	0.33~0.20	675~938 (26-9/16~36-15/16)	514~776 (20-1/4~30-9/16)
EF200mm f/1.8L USM	0.23~0.14	1167~1673 (45-15/16~65-7/8)	903~1409 (35-9/16~55-1/2)
EF200mm f/2.8L USM	0.32~0.14	977~1801 (38-7/16~70-15/16)	771~1595 (30-3/8~62-13/16)
EF300mm f/2.8L USM	0.21~0.09	1899~3786 (74-3/4~149-1/16)	1599~3486 (62-15/16~137-1/4)
EF300mm f/4L USM	0.24~0.09	1661~3925 (65-3/8~154-1/2)	1385~3649 (54-1/2~143-11/16)
EF400mm f/2.8L USM	0.19~0.07	2781~6730 (109-1/2~265)	2387~6335 (94~249-7/16)
EF400mm f/5.6L USM	0.21~0.07	2460~6610 (96-7/8~260-1/4)	2145~6295 (84-7/16~247-13/16)
EF500mm f/4.5L USM	0.17~0.06	3591~10314 (141-3/8~406-1/16)	3147~9870 (123-7/8~388-9/16)
EF600mm f/4L USM	0.16~0.05	4413~14214 (173-3/4~559-3/4)	3914~13718 (154-1/16~540-1/16)
EF1200mm f/5.6L USM	0.13~0.02	11334~53254 (394-1/4~2096-5/8)	9164~52404 (360-13/16~2063-1/8)
TS-E24mm f/3.5L	1.21~1.10	166~167 (6-1/2~6-9/16)	3~4 (1/8~3/16)
TS-E45mm f/2.8		Not Available	
TS-E90mm f/2.8	0.60~0.31	373~486 (14-11/16~19-1/8)	207~345 (8-1/8~13-9/16)

Lens	Magnification (X)		Focusing distance ranges mm (inch)		Working distance ranges mm (inch)	
	WIDE	TELE	WIDE	TELE	WIDE	TELE
EF20-35mm f/2.8L	Not Available	0.92~0.80	Not Available	181~189 (7-1/8~7-7/16)	Not Available	28~36 (1-1/8~1-7/16)
EF20-35mm f/3.5-4.5 USM	Not Available	1.00~0.80	Not Available	164~176 (6-7/16~6-15/16)	Not Available	25~37 (1~1-7/16)
EF28-70mm f/2.8L USM	1.05~0.94	0.64~0.40	213~218 (8-1/4~8-3/8)	298~374 (11-7/16~14-9/16)	3~8 (1/8~5/16)	112~188 (4-7/16~7-3/8)
EF28-80mm f/3.5-5.6II USM	1.15~0.94	0.73~0.36	164~169 (6-5/16~6-11/16)	262~417 (10-1/4~16-9/16)	12~22 (1/2~7/8)	107~270 (4-3/16~10-5/8)
EF28-105mm f/3.5-4.5 USM	0.75~0.73	0.44~0.27	177~182 (7~7-3/16)	470~630 (18-1/2~24-13/16)	32~37 (1-1/4~1-7/16)	298~458 (11-3/4~18-7/8)
EF35-80mm f/4-5.6III	0.97~0.75	0.70~0.35	166~181 (6-5/8~7-1/8)	259~417 (10-3/16~16-7/16)	26~48 (1~1-3/8)	118~283 (4-11/16~11-3/16)
EF35-80mm f/4-5.6 USM	0.99~0.75	0.74~0.35	167~183 (6-5/8~7-3/8)	253~419 (10~16-1/2)	25~48 (1~1-3/8)	111~284 (4-3/8~11-3/16)
EF35-105mm f/4.5-5.6 USM	0.75~0.73	0.44~0.27	177~183 (7~7-3/16)	473~633 (18-5/8~24-15/16)	40~41 (1-9/16~1-5/8)	315~476 (12-7/16~18-7/8)
EF35-135mm f/4-5.6USM	0.86~0.75	0.47~0.21	181~191 (7-1/8~7-1/2)	383~917 (15-1/16~36-1/8)	25~35 (1~1-3/8)	201~735 (7-15/16~28-15/16)
EF35-350mm f/3.5-5.6L USM	0.82~0.75	0.25~0.08	240~250 (9-1/2~9-7/8)	1490~4953 (58-11/16~194-7/8)	3~13 (1/8~1/2)	1178~4641 (46-3/8~182-3/4)
EF70-200mm f/2.8L USM	0.41~0.38	0.30~0.14	400~405 (15-3/4~15-15/16)	956~1728 (37-5/8~68-1/16)	138~143 (5-7/16~5-5/8)	694~1466 (27-5/16~57-11/16)
EF70-210mm f/3.5-4.5 USM	0.47~0.38	0.35~0.13	352~398 (13-7/8~15-11/16)	778~1992 (30-5/8~78-7/16)	163~210 (6-7/16~8-1/4)	541~1756 (21-5/16~69-1/8)
EF75-300mm f/4-5.6II USM	0.39~0.35	0.39~0.09	445~446 (17-1/2~17-9/16))	1249~3954 (49-3/16~155-11/16)	239~254 (9-7/16~10)	988~3707 (38-7/8~145-15/16)
EF80-200mm f/4.5-5.6I	0.39~0.33	0.33~0.14	451~480 (17-3/4~18-15/16)	990~1890 (39~74-7/16)	299~336 (11-3/4~13-1/4)	800~1708 (31-1/2~67-1/4)
EF100-300mm f/5.6L	0.34~0.27	0.39~0.10	617~660 (24-5/16~26)	1264~4013 (49-3/4~158)	365~424 (14-3/8~16-11/16)	984~3749 (38-3/4~147-5/8)
EF100-300mm f/4.5-5.6 USM	0.37~0.26	0.35~0.09	537~681 (21-1/8~26-13/16)	1130~4048 (44-1/2~17-5/8)	347~491 (13-11/16~19-5/16)	892~3810 (35-1/8~150)

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