

**F-Theta Lenses are used for laser marking, bar code reader, laser micromachining and other laser applications.**

- F-Theta lenses convert a rotational movement of a galvanometer mirror into a linear motion on the focal plane by using distortion effects.
- Telecentric type is also available that can be irradiated vertically to the focusing plane.
- Also available for fundamental YAG laser (1064nm), harmonic lasers (266nm, 355nm, 532nm).



#### Guide

- ▶ Transmittance value is a representative value only and is not guaranteed. If you have any questions, please feel free to contact our Sales Division.
- ▶ We accept orders to suit customized requirements.
- ▶ We also fabricate laser scanning systems which combine the galvanometer mirror and f $\theta$  lens as a unit.

#### Attention

- ▶ We do not recommend using f $\theta$  lens in an imaging system because it is designed for a scanning type optical system.
- ▶ Please position the incident pupil of the f $\theta$  lens beam into the scanning system (galvanometer mirror). If the incident pupil is not in position of the beam scanning system, the optimum focusing spot cannot be achieved because of increased aberration.

**f $\theta$  Lenses dimension table**

Part Number	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	$\phi$ G (mm)	$\phi$ H (mm)	I	$\phi$ J (mm)	K (mm)
f $\theta$ -100-266T	60	57.8	43	5	6	6	$\phi$ 97	$\phi$ 82g6	M80 P1	$\phi$ 69	74.8
f $\theta$ -150-266T	80	73.3	65	3	6	6	$\phi$ 122	$\phi$ 102g6	M100 P1	$\phi$ 89	88.3
f $\theta$ -100-355T	60	56.3	42	6	6	6	$\phi$ 97	$\phi$ 82g6	M80 P1	$\phi$ 69	74.3
f $\theta$ -100-355THG	80	109.6	59	9	6	6	$\phi$ 112	$\phi$ 102g6	M100 P1	$\phi$ 84	130.6
f $\theta$ -150-355T	80	72.3	64	4	6	6	$\phi$ 122	$\phi$ 102g6	M100 P1	$\phi$ 89	88.3
f $\theta$ -100-532T	60	51.5	50	—	6	4	$\phi$ 92	$\phi$ 82g6	M80 P1	—	61.5
f $\theta$ -300-1064	39	35.9	27.3	3.7	8	—	$\phi$ 91	—	M80 P1	$\phi$ 76	47.6
f $\theta$ -100-1064T	60	49.5	47.5	—	6.5	6	$\phi$ 92	$\phi$ 82g6	M80 P1	—	62

**f $\theta$  Lenses**

Part Number	Design wavelength [nm]	Focal length f [mm]	Entrance pupil diameter [mm]	Scanning angle [°]	Scanning Range [mm]	Telecentric	Working distance (WD) [mm]	Transmittance (Angle of Incidence: 0°) [%]
f $\theta$ -100-266T	266	100.4	$\phi$ 12	$\pm$ 15	$\phi$ 52	○	135.9	93
f $\theta$ -150-266T	266	149.9	$\phi$ 12	$\pm$ 15	$\phi$ 78	○	205.1	93
f $\theta$ -100-355T	355	99.85	$\phi$ 12	$\pm$ 15	$\phi$ 52	○	136.1	93
f $\theta$ -100-355THG	355	100.1	$\phi$ 14	$\pm$ 15	$\phi$ 52	○	60.94	90
f $\theta$ -150-355T	355	150.2	$\phi$ 12	$\pm$ 15	$\phi$ 78	○	207.2	93
f $\theta$ -100-532T	532	100.3	$\phi$ 12	$\pm$ 15	$\phi$ 52	○	121.1	90
f $\theta$ -300-1064	1064	299.8	$\phi$ 16	$\pm$ 23	$\phi$ 240	—	361.6	95
f $\theta$ -100-1064T	1064	100.3	$\phi$ 12	$\pm$ 15	$\phi$ 52	○	123.1	95

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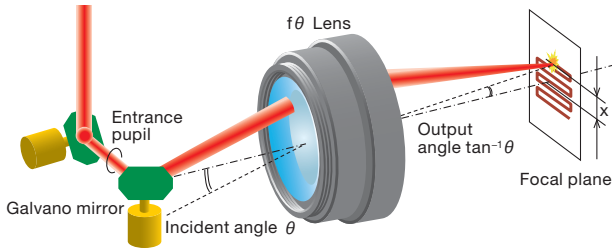
f $\theta$  Lenses

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**Schematic**



By using the f theta lens, it is possible to be moved a laser light spot in constant speed linear motion on the focal plane by scanning the mirrors such as galvanometer scanner mirrors.

The f theta lens enables this by the effect of distortion.

Mathematically it is expressed as following:

focal length = "f", ideal image height = "y", the angle of scanned = "θ" therefore,  $y = f\theta$ .

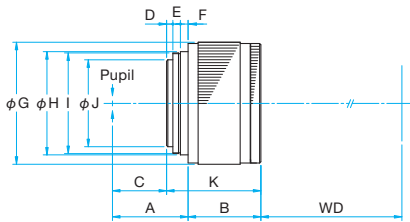
In the normal single lens, the ideal image height "y" is represented by "y = f tanθ".

Characteristics of both are the same in a small angle range. However, the difference is greater angle increases.

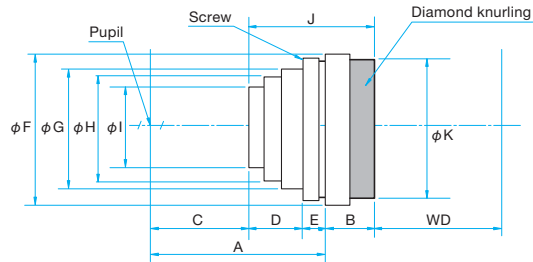
**Outline Drawing**

(in mm)

**fθ Lenses**



**fθ Lenses for YAG (fθ-L/fθ-B/fθ-270-1064)**



**fθ Lenses for YAG dimension table**

Part Number	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	φF (mm)	φG (mm)	φH (mm)	φI (mm)	J (mm)	φK (mm)	Screw
<b>fθ-100-532L</b>	53.3	17.8	22.5	22.8	8	φ89	φ80	φ72	φ60	48.6	φ83	M85 P1
<b>fθ-100-1064L</b>	53.3	17	20	25.3	8	φ87	φ80	φ69	φ57	50.3	φ83	M85 P1
<b>fθ-150-1064B</b>	63	19.8	26.8	28	8.2	φ87	φ80	φ74.5	φ64	56	φ86	M85 P1
<b>fθ-220-1064L</b>	59.8	21.1	32.1	19.7	8	φ97	φ80	—	φ68	48.8	φ97	M85 P1
<b>fθ-270-1064</b>	59.7	33.5	26.0	24.7	9	φ106	φ74	—	φ64	67.2	φ106	M85 P1

**fθ Lenses for YAG**

Part Number	Design wavelength [nm]	Focal length f [mm]	Entrance pupil diameter [mm]	Scanning angle [°]	Scanning Range [mm]	Telecentric	Working distance (WD) [mm]	Transmittance [%]
<b>fθ-100-532L</b>	532	100.2	φ12	±22.9	φ80	—	114.7	>95
<b>fθ-100-1064L</b>	1064	99.93	φ12	±22.9	φ80	—	109.6	>95
<b>fθ-150-1064B</b>	1064	152.1	φ15	±24.0	φ127.4	—	168.6	>95
<b>fθ-220-1064L</b>	1064	220.0	φ12	±24.0	φ184	—	254.2	>95
<b>fθ-270-1064</b>	1064	273.0	φ15	±24.13	φ230	—	318.9	>95

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