fθ Lenses | fθ

RoHS

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 fθ lens as a unit.

Attention

- We do not recommend using fθ lens in an imaging system because it is designed for a scanning type optical system.
- Please position the incident pupil of the fθ 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.

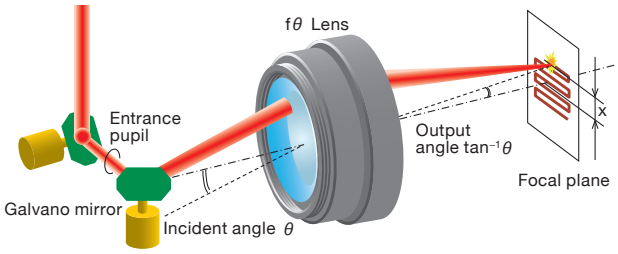
fθ Lenses dimension table

Part Number	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	ϕG (mm)	ϕH (mm)	I	ϕJ (mm)	K (mm)
fθ-100-266T	60	57.8	43	5	6	6	ϕ97	ϕ82g6	M80 P1	ϕ69	74.8
fθ-150-266T	80	73.3	65	3	6	6	ϕ122	ϕ102g6	M100 P1	ϕ89	88.3
fθ-100-355T	60	56.3	42	6	6	6	ϕ97	ϕ82g6	M80 P1	ϕ69	74.3
fθ-100-355THG	80	109.6	59	9	6	6	ϕ112	ϕ102g6	M100 P1	ϕ84	130.6
fθ-150-355T	80	72.3	64	4	6	6	ϕ122	ϕ102g6	M100 P1	ϕ89	88.3
fθ-100-532T	60	51.5	50	—	6	4	ϕ92	ϕ82g6	M80 P1	—	61.5
fθ-300-1064	39	35.9	27.3	3.7	8	—	ϕ91	—	M80 P1	ϕ76	47.6
fθ-100-1064T	60	49.5	47.5	—	6.5	6	ϕ92	ϕ82g6	M80 P1	—	62

fθ 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°) [%]
fθ-100-266T	266	100.4	ϕ12	±15	ϕ52	○	135.9	93
fθ-150-266T	266	149.9	ϕ12	±15	ϕ78	○	205.1	93
fθ-100-355T	355	99.85	ϕ12	±15	ϕ52	○	136.1	93
fθ-100-355THG	355	100.1	ϕ14	±15	ϕ52	○	60.94	90
fθ-150-355T	355	150.2	ϕ12	±15	ϕ78	○	207.2	93
fθ-100-532T	532	100.3	ϕ12	±15	ϕ52	○	121.1	90
fθ-300-1064	1064	299.8	ϕ16	±23	ϕ240	—	361.6	95
fθ-100-1064T	1064	100.3	ϕ12	±15	ϕ52	○	123.1	95

Schematic

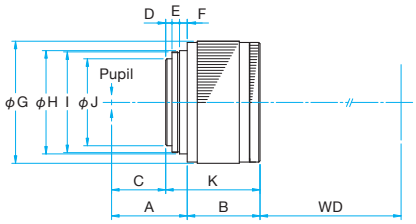


By using the f theta lens, it is possible to be moved a laser light spot in constant speed linear motion on the focal plane by scanning the mirrors such as galvanometer scanner mirrors.
The f theta lens enables this by the effect of distortion.
Mathmatically it is expressed as following;
focal length = "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 "$y = f \tan\theta$".
Characteristics of both are the same in a small angle range. However, the difference is greater angle increases.

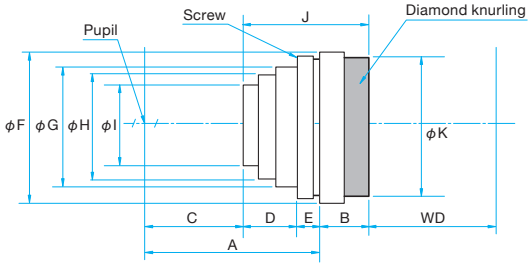
Outline Drawing

(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
fθ-100-532L	53.3	17.8	22.5	22.8	8	ϕ89	ϕ80	ϕ72	ϕ60	48.6	ϕ83	M85 P1
fθ-100-1064L	53.3	17	20	25.3	8	ϕ87	ϕ80	ϕ69	ϕ57	50.3	ϕ83	M85 P1
fθ-150-1064B	63	19.8	26.8	28	8.2	ϕ87	ϕ80	ϕ74.5	ϕ64	56	ϕ86	M85 P1
fθ-220-1064L	59.8	21.1	32.1	19.7	8	ϕ97	ϕ80	—	ϕ68	48.8	ϕ97	M85 P1
fθ-270-1064	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 [%]
fθ-100-532L	532	100.2	ϕ12	±22.9	ϕ80	—	114.7	>95
fθ-100-1064L	1064	99.93	ϕ12	±22.9	ϕ80	—	109.6	>95
fθ-150-1064B	1064	152.1	ϕ15	±24.0	ϕ127.4	—	168.6	>95
fθ-220-1064L	1064	220.0	ϕ12	±24.0	ϕ184	—	254.2	>95
fθ-270-1064	1064	273.0	ϕ15	±24.13	ϕ230	—	318.9	>95