Nikon Rayfact

Tochigi Nikon Industrial Lens

TOCHIGI NIKON CORPORATION
Marketing Sec.
Industrial Equipment Dept.

2-5x Variable Lens

• Features

- Variable magnification : 2 - 5x
- Prism optical optimization model available. (Coaxial vertical prism : Thickness up to 25mm)
  (Coaxial vertical prism not available at Tochigi Nikon)
- Large image size - ϕ84mm - For high resolution, large-sized line sensor cameras.
- Recommendable line sensor cameras - 5μm x 16K / 5.2μm x 12K / 7μm x 8K
- Less difference in performance, securing performance in the whole range of magnification.
- Variable diaphragm, open aperture F2.5
- Diaphragm and floating ring setting lockable screws
- Gear on the diaphragm ring and the floating ring to have the mechanism be variable
  by external driving.
- RoHs compliant

• Applications

- Inspection by high-resolution line censor cameras
- Flat panel inspection
- PCB inspection
- Wafer inspection

NikonRayfact2-5x Variable Lens

Specifications

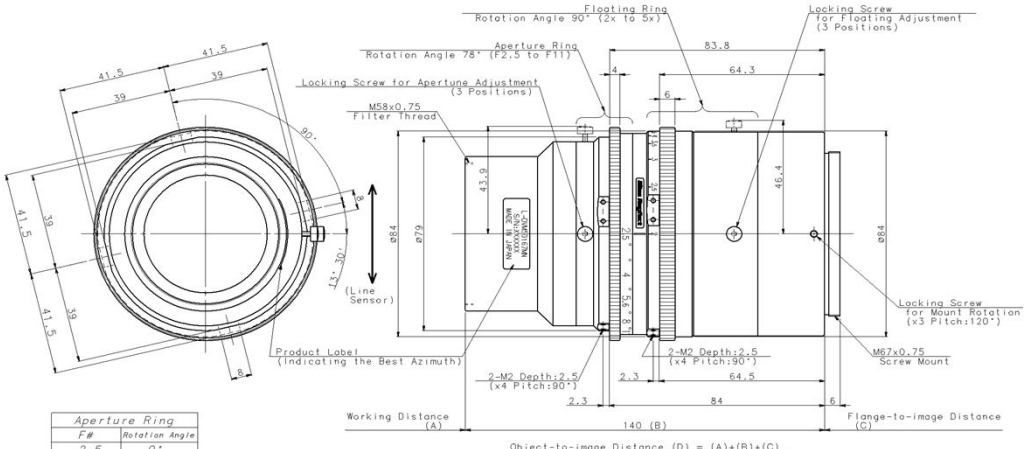
Model	L-OVM50167MN							
Magnification range	-2.0x～-5.0x							
Magnification	-2.0x	-2.5x	-3.0x	-3.5x	-4.0x	-4.5x	-5.0x	(-5.2x)※2
Focal length	116mm							
F Number (∞)	F2.5							
NA (Diaphragm open)	0.133	0.143	0.15	0.156	0.16	0.164	0.167	0.168
Reference wavelength	546.07nm (e-line)							
Wavelength range	400～700nm							
Image size	φ84mm							
Object size ※1	φ42mm	φ33.6mm	φ28mm	φ24mm	φ21mm	φ18.7mm	φ16.8mm	(φ16.2mm)
Distortion ※1	+0.08%	+0.01%	-0.02%	-0.03%	-0.03%	-0.03%	-0.03%	(-0.03%)
Relative illumination ※1	91.2%	95.7%	98.1%	98.9%	99.1%	99.1%	99.2%	(99.2%)
Aperture scale	2.5,2.8,4,5.6,8,11							
Object-to-image distance	503.6mm	550.4mm	601.0mm	653.8mm	707.9mm	763.0mm	818.7mm	(841.1mm)
Working distance	114.7mm	102.8mm	94.9mm	89.2mm	84.9mm	81.6mm	79.0mm	(78.1mm)
Mount size	M67(P=0.75)							
Flange-to image distance	248.8mm	307.5mm	366.1mm	424.6mm	483.0mm	541.4mm	599.8mm	(623.1mm)
Attachment size	M58(P=0.75)							
Diameter/length	φ84mm×140mm							
Weight	Approximately 1350g							

※1 Highest image height (Y'=42mm) at F2.5.

※2 -5.2x:To fix the magnification at -5.0x and move the lens outward up to the maximal point.

			-2.0x	-2.5x	-3.0x	-3.5x	-4.0x	-4.5x	-5.0x	(-5.2x)
Entrance pupil※3	d	[En.P]	60.75mm	60.75mm	60.75mm	60.75mm	60.75mm	60.75mm	60.75mm	(60.75mm)
	φ		φ47.2mm	φ47.2mm	φ47.3mm	φ47.4mm	φ47.4mm	φ47.4mm	φ47.4mm	(φ47.4mm)
Exit pupil ※3	d	[Ex.P]	98.57mm	98.55mm	98.52mm	98.49mm	98.46mm	98.43mm	98.41mm	(98.41mm)
	φ		φ46.4mm	φ46.5mm	φ46.6mm	φ46.7mm	φ46.8mm	φ46.8mm	φ46.9mm	(φ46.9mm)
Front Principal Point ※3		[Front.PP]	59.57mm	59.92mm	60.17mm	60.36mm	60.49mm	60.62mm	60.71mm	(60.71mm)
Rear Principal Point ※3		[Rear.PP]	99.74mm	99.37mm	99.10mm	98.88mm	98.72mm	98.57mm	98.45mm	(98.45mm)
Nodal Point Distance		[HH']	-19.3mm	-19.29mm	-19.27mm	-19.24mm	-19.21mm	-19.19mm	-19.16mm	(-19.16mm)

※3 Entrance pupil En.P and principal point H at the front tip point of the lens.
Exit pupil(Ex.P), Rear Principal Point(H') : at the mount point. Image side:「+」 Object side:「-」



Aperture Ring	
F#	Rotation Angle
2.5	0°
(2.8)	6°
(3.4)	15°
4	24°
(4.8)	33°
5.6	42°
(6.7)	51°
8	60°
(9.5)	69°
11	78°

Floating Ring					
8	Rotation Angle	(A)	(B)	(C)	(D)
-2.0	0°	114.72	140	248.84	503.56
-2.5	27°	102.84		307.52	550.36
-3.0	46°30'	94.89		366.09	600.98
-3.5	61°30'	89.21		424.58	653.79
-4.0	72°	84.94		483.00	707.94
-4.5	82°30'	81.60		541.43	763.03
-5.0	90°	78.95		599.79	818.74

	Aperture Ring	Floating Ring
Type	Spur Gear	
P.C.D.	ø86	
m	0.5	
z	172	

・Specifications unless any specific instructions are stated is at the standard magnification.
・Specifications are subject to change without prior notice.

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NikonRayfact2-5x Variable Lens : Prism suitable model

Specifications

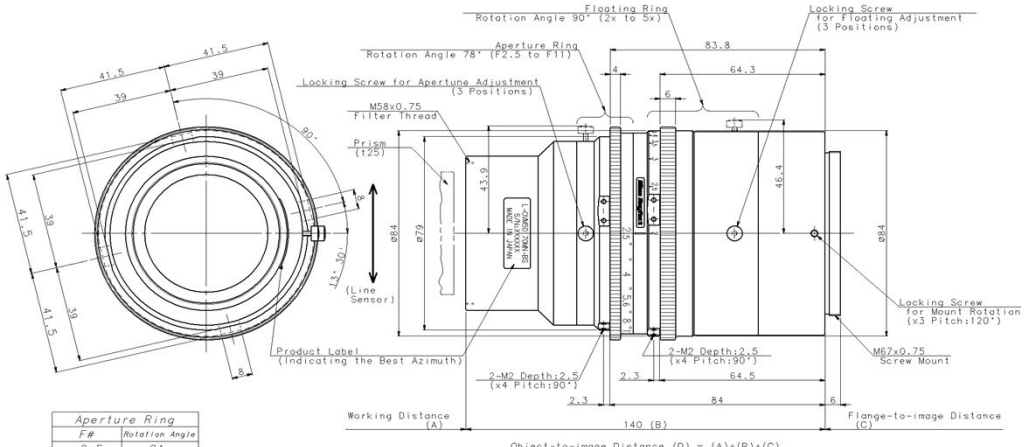
Model	L-OVM50170MN-BS							
Magnification range	-2.0x～-5.0x							
Magnification	-2.0x	-2.5x	-3.0x	-3.5x	-4.0x	-4.5x	-5.0x	(-5.2x)※2
Focal length	117mm							
F Number (∞)	F2.5							
NA (Diaphragm open)	0.133	0.144	0.151	0.157	0.162	0.166	0.17	0.171
Reference wavelength	546.07nm(e-line)							
Wavelength range	400～700nm							
Image size	φ84mm							
Object size ※1	φ42mm	φ33.6mm	φ28mm	φ24mm	φ21mm	φ18.7mm	φ16.8mm	(φ16.2mm)
Distortion ※1	+0.06%	-0.01%	-0.03%	-0.04%	-0.05%	-0.04%	-0.04%	(-0.04%)
Relative illumination ※1	88.9%	93.6%	96.2%	97.3%	97.9%	98.3%	98.7%	(98.8%)
Aperture scale	2.5,2.8,4,5.6,8,11							
Object-to-image distance	513.7mm	561mm	612.1mm	665.4mm	720.1mm	775.7mm	831.9mm	(854.5mm)
Working distance	119.8mm	107.8mm	99.8mm	94mm	89.7mm	86.35mm	83.7mm	(82.8mm)
Mount size	M67(P=0.75)							
Flange-to image distance	253.9mm	313.2mm	372.3mm	431.4mm	490.3mm	549.3mm	608.3mm	(631.8mm)
Attachment size	M58(P=0.75)							
Diameter/length	φ84mm×140mm							
Weight	Approximately 1350g							

※1 Highest image height (Y'=42mm) at F2.5 with prism (25mm thickness・material BK7 or equivalent) to put between an object and the lens.

※2 -5.2x:To fix the magnification at -5.0x and move the lens outward up to the maximal point.

			-2.0x	-2.5x	-3.0x	-3.5x	-4.0x	-4.5x	-5.0x	(-5.2x)
Entrance pupil※3	d	[En.P]	58.57mm	58.57mm	58.57mm	58.57mm	58.57mm	58.57mm	58.57mm	(58.57mm)
	φ		φ45.7mm	φ45.8mm	φ45.9mm	φ45.9mm	φ46.0mm	φ46.0mm	φ46.0mm	(φ46.0mm)
Exit pupil ※3	d	[Ex.P]	104.62mm	104.63mm	104.62mm	104.60mm	104.58mm	104.56mm	104.54mm	(104.54mm)
	φ		φ48.0mm	φ48.1mm	φ48.2mm	φ48.3mm	φ48.4mm	φ48.4mm	φ48.5mm	(φ48.5mm)
Front Principal Point ※3		[Front.PP]	64.76mm	65.11mm	65.35mm	65.54mm	65.66mm	65.79mm	65.88mm	(65.88mm)
Rear Principal Point ※3		[Rear.PP]	98.09mm	97.70mm	97.42mm	97.19mm	97.03mm	96.87mm	96.75mm	(96.75mm)
Nodal Point Distance		[HH']	-22.9mm	-22.8mm	-22.8mm	-22.7mm	-22.7mm	-22.7mm	-22.6mm	-22.6mm

※3 Entrance pupil En.P and principal point H at the front tip point of the lens.
Exit pupil(Ex.P), Rear Principal Point(H') : at the mount point. Image side:「+」 Object side:「-」



Aperture Ring	
F#	Rotation Angle
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(3.4)	15°
4	24°
(4.8)	33°
5.6	42°
(6.7)	51°
8	60°
(9.5)	69°
11	78°

Floating Ring					
β	Rotation Angle	(A)	(B)	(C)	(D)
-2.0	0°	119.79	140	253.92	513.71
-2.5	27°	107.78		313.18	560.96
-3.0	46°30'	99.76		372.31	612.07
-3.5	61°30'	94.02		431.37	665.39
-4.0	72°	89.72		490.34	720.06
-4.5	82°30'	86.35		549.33	775.68
-5.0	90°	83.66		608.26	831.92

	Aperture Ring	Floating Ring
Type	Spur Gear	
P.C.D.	φ86	
m	0.5	
z	172	

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