



 **NANITAR**[®]
AMETEK[®]

RESOLV4K
LENS SERIES

Superior Performance
& Greater Throughput



RESOLV4K

LENS SERIES

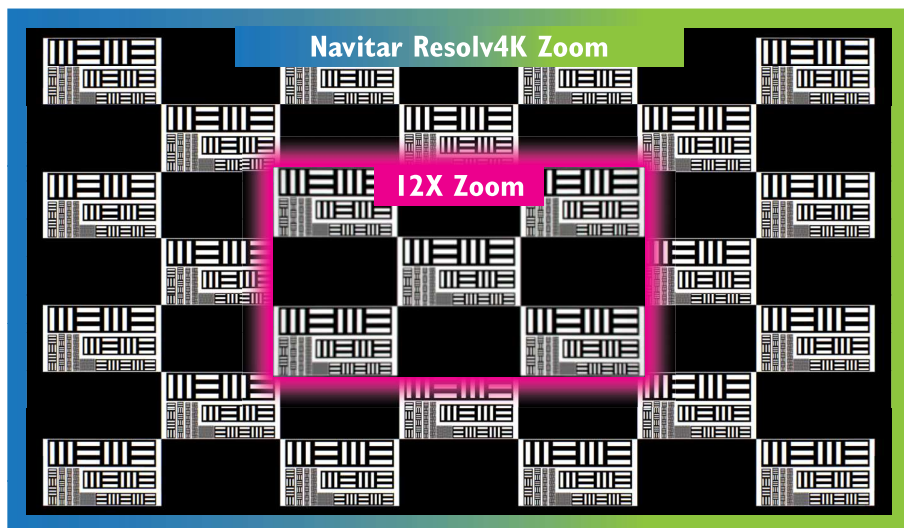
Greater Throughput

The Resolv4K Lens Series was designed from first order principles to maximize the usage of a sensors with higher pixel densities. Numerous adapter options allow users to employ a range of sensors from 1/2" through APS formats and beyond. On the front end of the zoom lens attachments give users the best of both worlds; the low mag end of zoom gives wide fields of view with no sacrifice in MTF or loss of illumination, while the high mag end delivers microscope objective like resolution at extremely long working distances.

The Resolv4K lens has been designed not only for superior visible wavelength axial color correction, but dramatically increased wavelength focusing ability with Visible through Near Infrared (Vis-NIR) and SWIR options. Larger aperture lens attachments significantly increase the usable FOV for coaxial lighting options.

Larger Field of View

Navitar's Resolv4K Series offers so much more resolving power, that a 400- 600% larger field of view is possible when compared to traditional zoom imaging, without any loss of detail. No need to stitch together multiple images from multiple captures.

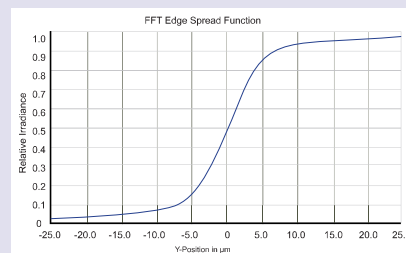


12X Zoom at Low Mag with 2/3" 2MP sensor
18.4mm

Resolv4K Zoom at Low Mag with 0.5X Lens Attachment and 8.9MP sensor.
Resolv4K has 2.4X horizontal FOV for 476% more total FOV area covered

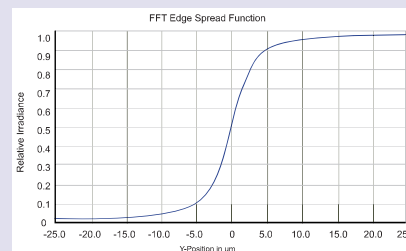
44.2mm

12X Zoom



13.6μm wide transition from full off to full on.

Navitar Resolv4K Zoom



9.6μm wide transition from full off to full on, a 30% improvement even at a significantly larger FOV and a longer working distance.

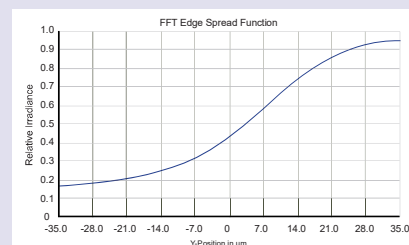
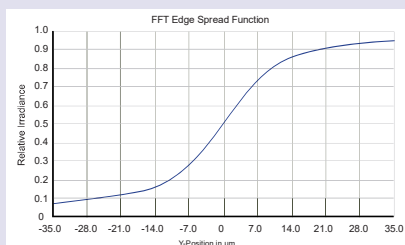
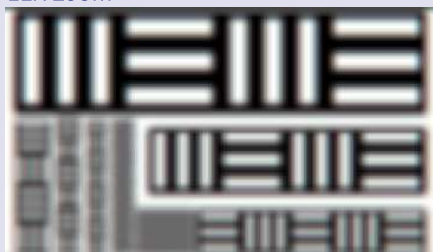
Note: Edge spread functions indicate the lens performance of a system by showing how quickly a black to white edge transition is detected by a lens. A 10% to 90% grey level value at the sensor is shown here as indicating a full off to full on.

& Larger Field of View

Higher Resolution

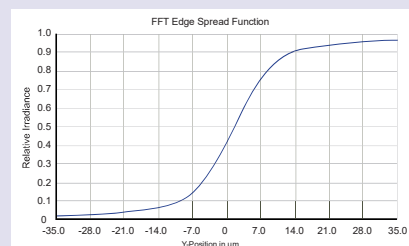
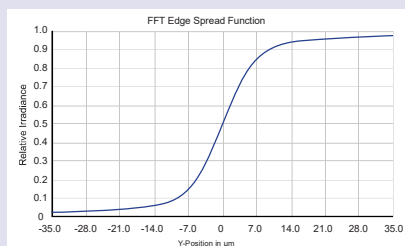
Resolv4K's higher NA, along with its superior aberration correction, gives more precise measurement capabilities than ever. Even comparing a 4.5X zoom point to a 7X mag system, the exceptional quality of the Resolv4K design delivers superior performance, as shown in the black to white transitions in the edge spread functions below. System performance holds up all the way to the corner of the sensor, so multiple regions of interest can be set regardless of their location in your FOV. Your edge detection software will notice the difference.

12X Zoom



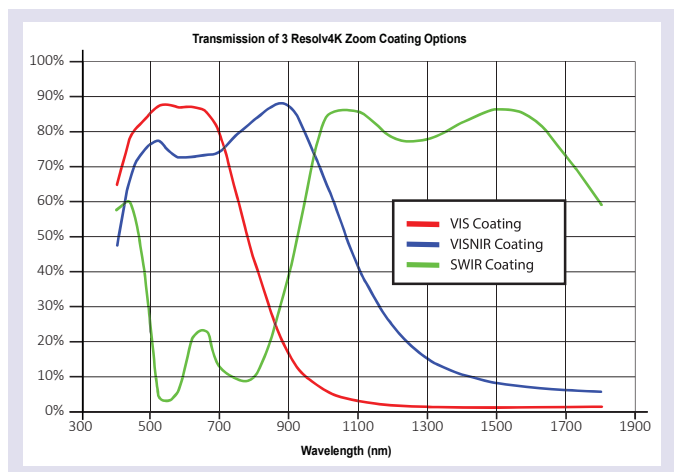
12X Zoom @ 7X High Mag | 2MP Sensor - 0.79μm / pixel | 1.55mm FOV - 1.28 mm² Area

Navitar Resolv4K Zoom



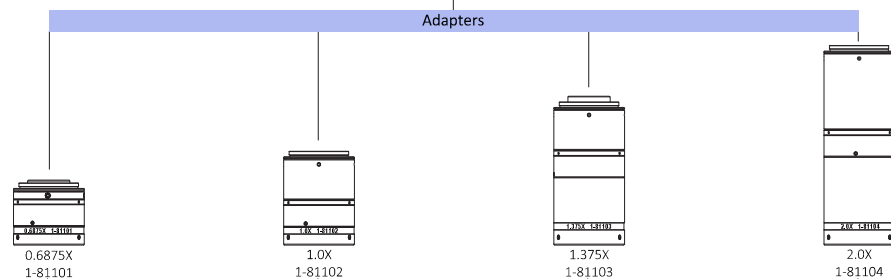
Resolv4K Zoom @ 4.5X High Mag | 8.9MP Sensor - 0.76μm / pixel | 3.56mm FOV - 5.20 mm² Area (3.25X more)

Left: Zoomed in inset of resolution lines, 0.5μm, 1μm, 2μm, 3μm, 4μm, 6μm, 9μm patterns **Center:** Edge spread function, on axis **Right:** Edge spread function, corner of the sensor



Expanded Wavelengths

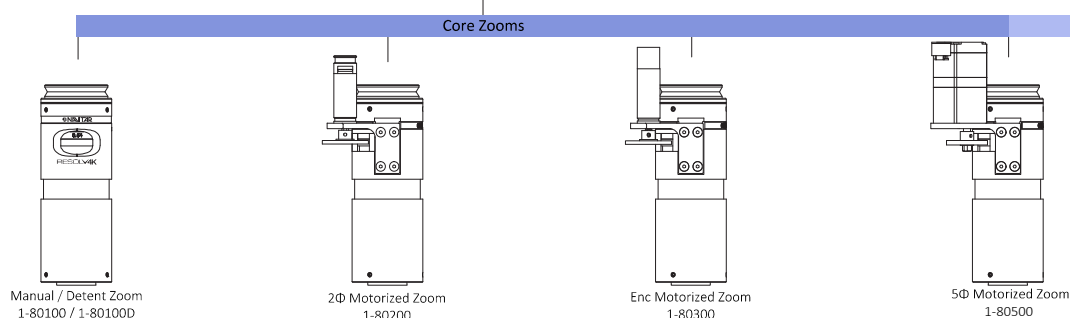
The Resolv4K lens series comes in visible, Vis-NIR and SWIR coating options. The visible options produce superior axial color correction to existing zoom lenses. The Vis-NIR option allows precision surface inspection in the deep blue, while performing sub-surface inspection at 1100nm without refocusing or loss of transmission. Using the SWIR goes even further beneath the surface to see damage and defects in food and silicon wafer inspection, among other applications. SWIR and Vis-NIR options are available for the following part numbers:



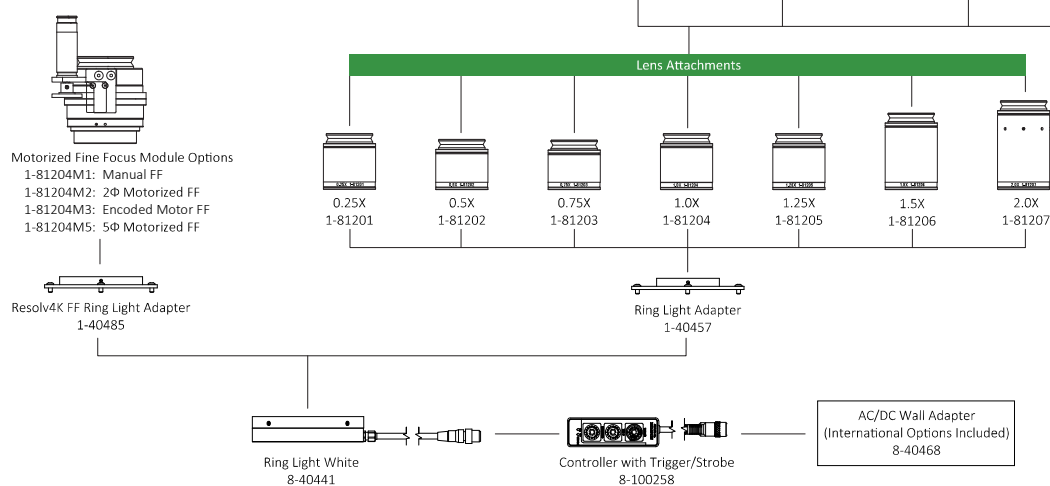
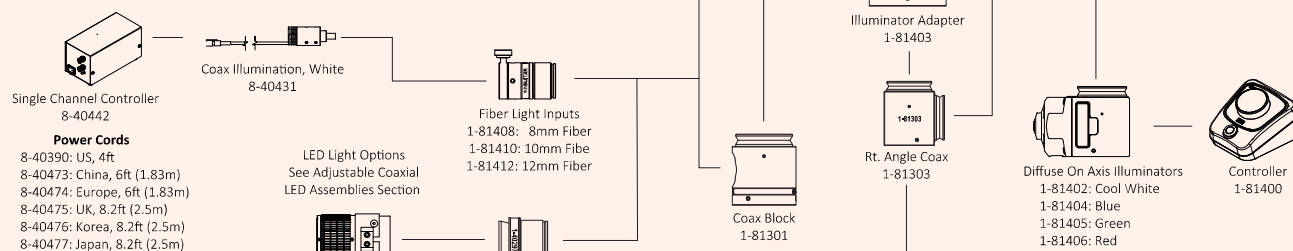
Upper Interface Options:

1-81302: 90° Fold
1-81310: Filter Holder
1-81314: Adjustable Iris
1-81303: Rt. Angle Coax*

*See your Navitar sales representative for details regarding your application.



LIGHTING OPTIONS



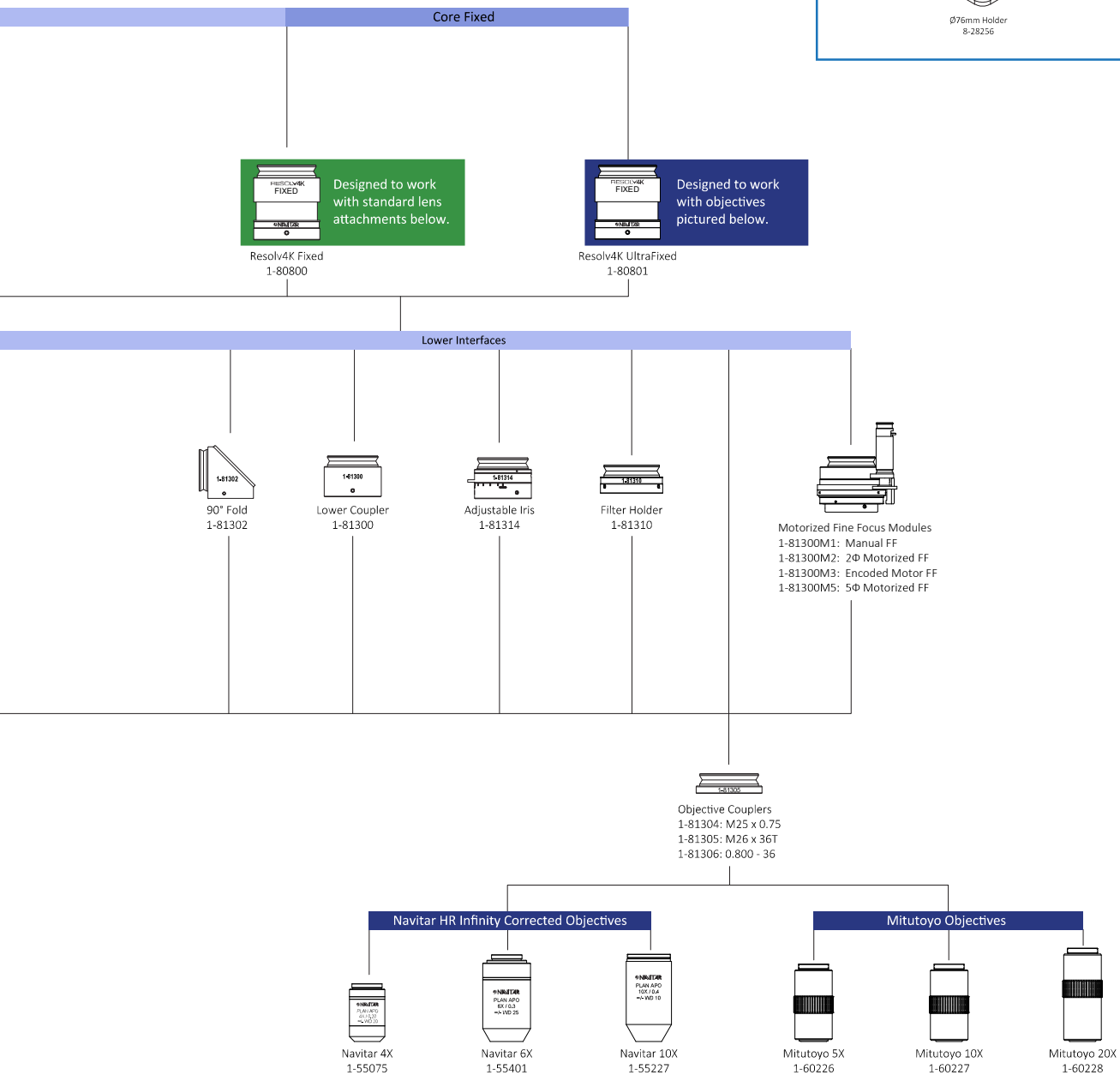
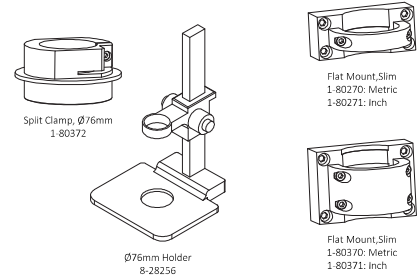
RESOLV4K System Diagram

ZOOM • FIXED • ULTRAFIXED

Motor Options

Cable Length	2 Phase Motor Cable (for 1-80200)	Encoded Motor Cable (for 1-80300)	5 phase motor Cable (for 1-80500)
24"	1-40283	1-40286	1-40290
48"	1-40282	1-40285	1-40289
72"	1-40281	1-40284	1-40170

Mounting Options



Resolv4K Zoom Field of View Matrix

Lens Attachment	Rear Adapter Magnification ⇄ Ideal Camera Format ⇄ Pixel Resolution ⇄		0.6875X 2/3"	1X 1"	1.375X 4/3"	2X 32mm (APS)	Resolve Limit	Depth of Field
	Working Distance	Format	Low - High	Low - High	Low - High	Low - High		
0.25X 0.008 - 0.024 NA 1-81201	359.5 mm	Magnification ⇄	0.10X - 0.77X	0.16X - 1.13X	0.22X - 1.55X	0.32X - 2.25X	40.85 - 14.13 µm	7.41 - 0.89 mm
		2/3" Sensor	100.00 - 14.22 mm	68.75 - 9.78 mm	50.00 - 7.11 mm	34.38 - 5.17 mm		
		1" Sensor	-	100.00 - 14.22 mm	72.73 - 10.34 mm	50.00 - 7.11 mm		
		1.1" Sensor	-	110.00 - 15.64 mm	80.00 - 11.38 mm	55.00 - 7.82 mm		
		4/3" Sensor	-	-	100.00 - 14.22 mm	68.75 - 9.78 mm		
		32mm Sensor	-	-	-	100.00 - 14.22 mm		
0.5X 0.016 - 0.048 NA 1-81202	173 mm	Magnification ⇄	0.22X - 1.55X	0.32X - 2.25X	0.44X - 3.09X	0.64X - 4.50X	20.43 - 7.06 µm	1.85 - 0.22 mm
		2/3" Sensor	50.00 - 7.11 mm	34.38 - 4.89 mm	25.00 - 3.56 mm	17.19 - 2.44 mm		
		1" Sensor	-	50.00 - 7.11 mm	36.36 - 5.17 mm	25.00 - 3.56 mm		
		1.1" Sensor	-	55.00 - 7.82 mm	40.00 - 5.69 mm	27.50 - 3.91 mm		
		4/3" Sensor	-	-	50.00 - 7.11 mm	34.38 - 4.89 mm		
		32mm Sensor	-	-	-	50.00 - 7.11 mm		
0.75X 0.025 - 0.071 NA 1-81203	110 mm	Magnification ⇄	0.33X - 2.32X	0.48X - 3.38X	0.66X - 4.64X	0.96X - 6.75X	13.62 - 4.71 µm	0.82 - 0.10 mm
		2/3" Sensor	33.33 - 4.74 mm	22.92 - 3.26 mm	16.67 - 2.37 mm	11.46 - 1.63 mm		
		1" Sensor	-	33.33 - 4.74 mm	24.24 - 3.45 mm	16.67 - 2.37 mm		
		1.1" Sensor	-	36.67 - 5.21 mm	26.67 - 3.79 mm	18.33 - 2.61 mm		
		4/3" Sensor	-	-	33.33 - 4.74 mm	22.94 - 3.26 mm		
		32mm Sensor	-	-	-	33.33 - 4.74 mm		
1.0X 0.033 - 0.095 NA 1-81204	90 mm	Magnification ⇄	0.44X - 3.09X	0.64X - 4.50X	0.88X - 6.19X	1.28X - 9.00X	10.21 - 3.53 µm	0.46 - 0.055 mm
		2/3" Sensor	25.00 - 3.56 mm	17.19 - 2.44 mm	12.50 - 1.78 mm	8.59 - 1.22 mm		
		1" Sensor	-	25.00 - 3.56 mm	18.18 - 2.59 mm	12.50 - 1.78 mm		
		1.1" Sensor	-	27.50 - 3.91 mm	20.00 - 2.84 mm	13.75 - 1.96 mm		
		4/3" Sensor	-	-	25.00 - 3.56 mm	17.19 - 2.44 mm		
		32mm Sensor	-	-	-	25.00 - 3.56 mm		
1.25X 0.041 - 0.119 NA 1-81205	72 mm	Magnification ⇄	0.55X - 3.87X	0.80X - 5.63X	1.10X - 7.73X	1.60X - 11.25X	8.17 - 2.83 µm	0.30 - 0.035 mm
		2/3" Sensor	20.00 - 2.84 mm	13.75 - 1.96 mm	10.00 - 1.42 mm	6.88 - 0.98 mm		
		1" Sensor	-	20.00 - 2.84 mm	14.55 - 2.07 mm	10.00 - 1.42 mm		
		1.1" Sensor	-	22.00 - 3.13 mm	16.00 - 2.28 mm	11.00 - 1.56 mm		
		4/3" Sensor	-	-	20.00 - 2.84 mm	13.75 - 1.96 mm		
		32mm Sensor	-	-	-	20.00 - 2.84 mm		
1.5X 0.049 - 0.142 NA 1-81206	46.5 mm	Magnification ⇄	0.66X - 4.64X	0.96X - 6.75X	1.32X - 9.28X	1.92X - 13.50X	6.81 - 2.35 µm	0.206 - 0.025 mm
		2/3" Sensor	16.67 - 2.37 mm	11.46 - 1.63 mm	8.33 - 1.19 mm	5.73 - 0.81 mm		
		1" Sensor	-	16.67 - 2.37 mm	12.12 - 1.72 mm	8.33 - 1.19 mm		
		1.1" Sensor	-	18.33 - 2.61 mm	13.33 - 1.90 mm	9.17 - 1.30 mm		
		4/3" Sensor	-	-	16.67 - 2.37 mm	11.46 - 1.63 mm		
		32mm Sensor	-	-	-	16.67 - 2.37 mm		
2.0X 0.066 - 0.190 NA 1-81207	32.3 mm	Magnification ⇄	0.88X - 6.19X	1.28X - 9.00X	1.76X - 12.38X	2.56X - 18.00X	5.11 - 1.77 µm	0.116 - 0.014 mm
		2/3" Sensor	12.50 - 1.78 mm	8.59 - 1.22 mm	6.25 - 0.89 mm	4.30 - 0.61 mm		
		1" Sensor	-	12.50 - 1.78 mm	9.09 - 1.29 mm	6.25 - 0.89 mm		
		1.1" Sensor	-	13.75 - 1.96 mm	10.00 - 1.42 mm	6.88 - 0.98 mm		
		4/3" Sensor	-	-	12.50 - 1.78 mm	8.59 - 1.22 mm		
		32mm Sensor	-	-	-	12.50 - 1.78 mm		

NOTE: Coax and fine focus options all maintain same FOV, resolution, and working distance, subject to adequate lighting

The above fields of view are measured diagonally in millimeters (Horizontal = Diagonal x 0.8 and Vertical = Diagonal x 0.6) on a 4:3 aspect ratio sensor. Dark Gray box: Contact your Navitar sales representative for further guidance when selecting this option.

Resolv4K Fixed System

The new Resolv4K Fixed system is a combination of the superb optical performance of the Resolv4K Zoom and design principles of our Precise Eye Fixed that is ideal for fixed field of view applications with closer working distances. The Resolv4K Fixed lens offers higher magnification and resolving power than standard enlarging or SLR lenses in macro mode.

- High apertures improve resolving power by 30% at familiar working distances
- Available interface modules allow users to build their system specifically for their needs
- Standard large camera format options
- Compatible with 10MP cameras and beyond
- Built-in rear adapter fine manipulation focus
- Larger focus options with motorization available
- Compatible with Infinity Corrected Objectives

Resolv4K Fixed Field of View Matrix (in mm at nominal W.D.)

Lens Attachment	Working Distance	Depth of Field	Resolution Limit	Camera Adapter ⇄	0.6875X	1X	1.375X	2X
				Pixel Resolution ⇄	1.85 μm	2.68 μm	3.69 μm	5.37 μm
0.25X 0.025 NA 1-81201	359.5 mm	0.88 mm	13.42 μm	Magnification ⇄	0.275X	0.40X	0.55X	0.80X
				2/3" Sensor	40.00 mm	27.50 mm	20.00 mm	13.75 mm
				1" Sensor	-	40.00 mm	29.09 mm	20.00 mm
				1.1" Sensor	-	44.00 mm	32.00 mm	22.00 mm
				4/3" Sensor	-	-	40.00 mm	27.50 mm
				APS	-	-	-	40.00 mm
0.5X 0.05 NA 1-81202	173 mm	0.22 mm	6.71 μm	Magnification ⇄	0.55X	0.80X	1.10X	1.60X
				2/3" Sensor	20.00 mm	13.75 mm	10.00 mm	6.88 mm
				1" Sensor	-	20.00 mm	14.55 mm	10.00 mm
				1.1" Sensor	-	22.00 mm	16.00 mm	11.00 mm
				4/3" Sensor	-	-	20.00 mm	13.75 mm
				APS	-	-	-	20.00 mm
0.75X 0.075 NA 1-81203	110 mm	0.0978 mm	4.47 μm	Magnification ⇄	0.825X	1.20X	1.65X	2.40X
				2/3" Sensor	13.33 mm	9.17 mm	6.67 mm	4.58 mm
				1" Sensor	-	13.33 mm	9.70 mm	6.67 mm
				1.1" Sensor	-	14.67 mm	10.67 mm	7.33 mm
				4/3" Sensor	-	-	13.33 mm	9.17 mm
				APS	-	-	-	13.33 mm
1.0X 0.1 NA 1-81204	90 mm	0.055 mm	3.36 μm	Magnification ⇄	1.10X	1.60X	2.20X	3.20X
				2/3" Sensor	10.00 mm	6.88 mm	5.00 mm	3.44 mm
				1" Sensor	-	10.00 mm	7.27 mm	5.00 mm
				1.1" Sensor	-	11.00 mm	8.00 mm	5.50 mm
				4/3" Sensor	-	-	10.00 mm	6.88 mm
				APS	-	-	-	10.00 mm
1.25X 0.125 NA 1-81205	72 mm	0.0352 mm	2.68 μm	Magnification ⇄	1.375X	2.00X	2.750X	4.00X
				2/3" Sensor	8.00 mm	5.50 mm	4.00 mm	2.75 mm
				1" Sensor	-	8.00 mm	5.82 mm	4.00 mm
				1.1" Sensor	-	8.80 mm	6.40 mm	4.40 mm
				4/3" Sensor	-	-	8.00 mm	5.50 mm
				APS	-	-	-	8.00 mm
1.5X 0.15 NA 1-81206	46.5 mm	0.0244 mm	2.24 μm	Magnification ⇄	1.650X	2.40X	3.30X	4.80X
				2/3" Sensor	6.67 mm	4.58 mm	3.33 mm	2.29 mm
				1" Sensor	-	6.67 mm	4.85 mm	3.33 mm
				1.1" Sensor	-	7.33 mm	5.33 mm	3.67 mm
				4/3" Sensor	-	-	6.67 mm	4.58 mm
				APS	-	-	-	6.67 mm
2X 0.20 NA 1-81207	32.3 mm	0.0138 mm	1.68 μm	Magnification ⇄	2.20X	3.20X	4.40X	6.40X
				2/3" Sensor	5.00 mm	3.44 mm	2.50 mm	1.72 mm
				1" Sensor	-	5.00 mm	3.64 mm	2.50 mm
				1.1" Sensor	-	5.50 mm	4.00 mm	2.75 mm
				4/3" Sensor	-	-	5.00 mm	3.44 mm
				APS	-	-	-	5.00 mm

Dark Gray box: Contact your Navitar sales representative for further guidance when selecting this option.
For 4:3 aspect ratio sensor; Horizontal = Diagonal x 0.8, Vertical = Diagonal x 0.6 APS- 32mm image circle

Resolv4K Field of View Matrix with HR Objectives (mm)

	Objective Lens	Rear Adapter Magnification ⇄		0.6875X	1X	1.375X	2X	Resolve Limit	Depth of Field
		Ideal Camera Format ⇄		2/3"	1"	4/3"	32mm (APS)		
		Pixel Resolution ⇄		2.24 - 5.47 µm	3.26 - 7.95 µm	4.48 - 10.93 µm	6.51 - 15.90 µm		
		Working Distance	Format	Low - High	Low - High	Low - High	Low - High		
UltraZoom	Navitar 4X 0.066 - 0.190 NA 1-55075	20 mm	Magnification ⇄	0.88X- 6.19X	1.28X- 9.00X	1.76X- 12.38X	2.56X- 18.00X	5.11 - 1.77 µm	116 - 14 µm
			2/3" Sensor	8.10- 1.78 mm	8.10- 1.22 mm	6.25- 0.89 mm	4.30- 0.61 mm		
			1" Sensor	-	8.10- 1.78 mm	8.10- 1.29 mm	6.25- 0.89 mm		
			1.1" Sensor	-	8.10- 1.96 mm	8.10- 1.42 mm	6.88- 0.98 mm		
			4/3" Sensor	-	-	8.10- 1.78 mm	8.10- 1.22 mm		
			32mm Sensor	-	-	-	8.10- 1.78 mm		
	Navitar 6X 0.099 - 0.285 NA 1-55401	25 mm	Magnification ⇄	1.32X- 9.28X	1.92X- 13.50X	2.64X-18.56X	3.84X- 27.00X	3.40 - 1.18 µm	51 - 6.2 µm
			2/3" Sensor	6.25- 1.19 mm	6.25- 0.81 mm	4.17- 0.59 mm	2.86- 0.41 mm		
			1" Sensor	-	6.25- 1.19 mm	6.25- 0.86 mm	4.17- 0.59 mm		
			1.1" Sensor	-	6.25- 1.30 mm	6.25- 0.95 mm	4.58- 0.65 mm		
			4/3" Sensor	-	-	6.25- 1.19 mm	6.25- 0.81 mm		
			32mm Sensor	-	-	-	6.25- 1.19 mm		
	Navitar 10X 0.164 - 0.400 NA 1-55227	10 mm	Magnification ⇄	2.20X- 15.47X	3.20X- 22.50X	4.40X- 30.94X	6.40X- 45.00X	2.04 - 0.84 µm	19 - 3.1 µm
			2/3" Sensor	3.20- 0.71 mm	3.20- 0.49 mm	2.50- 0.36 mm	1.72- 0.24 mm		
			1" Sensor	-	3.20- 0.71 mm	3.20- 0.52 mm	2.50- 0.36 mm		
			1.1" Sensor	-	3.20- 0.78 mm	3.20- 0.57 mm	2.75- 0.39 mm		
			4/3" Sensor	-	-	3.20- 0.71 mm	3.20- 0.49 mm		
			32mm Sensor	-	-	-	3.20- 0.71 mm		
	Mitotoyo 5X 0.082 - 0.140 NA 1-60226	34 mm	Magnification ⇄	1.10X- 7.73X	1.60X- 11.25X	2.20X- 15.47X	3.20X- 22.50X	4.09 - 2.40 µm	74.1 - 25.5 µm
			2/3" Sensor	4.80- 1.42 mm	4.80- 0.98 mm	4.80- 0.71 mm	3.44- 0.49 mm		
			1" Sensor	-	4.80- 1.42 mm	4.80- 1.03 mm	4.80- 0.71 mm		
			1.1" Sensor	-	4.80- 1.56 mm	4.80- 1.14 mm	4.80- 0.78 mm		
			4/3" Sensor	-	-	4.80- 1.42 mm	4.80- 0.98 mm		
			32mm Sensor	-	-	-	4.80- 1.42 mm		
	Mitotoyo 10X 0.164 - 0.280 NA 1-60227	33 mm	Magnification ⇄	2.20X- 15.47X	3.20X- 22.50X	4.40X- 30.94X	6.40X- 45.00X	2.04 - 1.20 µm	18.5 - 6.4 µm
			2/3" Sensor	2.40- 0.71 mm	2.40- 0.49 mm	2.40- 0.36 mm	1.72- 0.24 mm		
			1" Sensor	-	2.40- 0.71 mm	2.40- 0.52 mm	2.40- 0.36 mm		
			1.1" Sensor	-	2.40- 0.78 mm	2.40- 0.57 mm	2.40- 0.39 mm		
			4/3" Sensor	-	-	2.40- 0.71 mm	2.40- 0.49 mm		
			32mm Sensor	-	-	-	2.40- 0.71 mm		
	Mitotoyo 20X 0.329 - 0.420 NA 1-60228	20 mm	Magnification ⇄	4.40X- 30.94X	6.40X- 45.00X	8.80X- 61.88X	12.80X- 90.00X	1.02 - 0.80 µm	4.6 - 2.8 µm
			2/3" Sensor	1.20- 0.36 mm	1.20- 0.24 mm	1.20- 0.18 mm	0.86- 0.12 mm		
			1" Sensor	-	1.20- 0.36 mm	1.20- 0.26 mm	1.20- 0.18 mm		
			1.1" Sensor	-	1.20- 0.39 mm	1.20- 0.28 mm	1.20- 0.20 mm		
			4/3" Sensor	-	-	1.20- 0.36 mm	1.20- 0.24 mm		
			32mm Sensor	-	-	-	1.20- 0.36 mm		

	Navitar Objective Lens	Rear Adapter Magnification ⇄		0.6875X	1X	1.375X	2X	Resolve Limit	Depth of Field
		Pixel Resolution ⇄		1.85 µm	2.68 µm	3.69 µm	5.37 µm		
		Working Distance		Diagonal	Diagonal	Diagonal	Diagonal		
		Format		Diagonal	Diagonal	Diagonal	Diagonal		
Fixed	4X 0.200 NA 1-55075	20 mm	Magnification ⇄	2.20X	3.20X mm	4.40X mm	6.40X	1.77 µm	13.75 µm
			2/3" Sensor	5.00 mm	3.44 mm	2.50 mm	1.72 mm		
			1" Sensor	-	5.00 mm	3.64 mm	2.50 mm		
			1.1" Sensor	-	5.50 mm	4.00 mm	2.75 mm		
			4/3" Sensor	-	-	5.00 mm	3.44 mm		
			APS	-	-	-	5.00 mm		
	6X 0.300 NA 1-55401	25 mm	Magnification ⇄	3.30X	4.80X	6.60X	9.60X	1.12 µm	6.11 µm
			2/3" Sensor	3.33 mm	2.29 mm	1.67 mm	1.15 mm		
			1" Sensor	-	3.33 mm	2.42 mm	1.67 mm		
			1.1" Sensor	-	3.67 mm	2.67 mm	1.83 mm		
			4/3" Sensor	-	-	3.33 mm	2.29 mm		
			APS	-	-	-	3.33 mm		
	10X 0.400 NA 1-55227	10 mm	Magnification ⇄	5.50X	8.00X	11.00X	16.00X	0.70 µm	3.44 µm
			2/3" Sensor	2.00 mm	1.38 mm	1.00 mm	0.69 mm		
			1" Sensor	-	2.00 mm	1.45 mm	1.00 mm		
			1.1" Sensor	-	2.20 mm	1.60 mm	1.10 mm		
			4/3" Sensor	-	-	2.00 mm	1.38 mm		
			APS	-	-	-	2.00 mm		

Dark Gray box: Contact your Navitar sales representative for further guidance when selecting this option.