



12X Zoom system dimensions can be found on our website at www.machinevision.navitar.com.

12X Zoom

12X Zoom Field of View Matrix (in mm)

Lens Attachment	Working Distance	Camera Formats/ Parameters	0.5X Adapter Low-High	0.67X Adapter Low-High	1X Adapter Low-High	1.33X Adapter Low-High	2X Adapter Low-High	3.5X Adapter Low-High	Resolve Limit (Microns) Low - High	Depth of Field (mm) Low-High
0.25X (2)0.005 - 0.025 N.A. 1-50011	341	Mag.	0.07X - 0.87X	0.10X - 1.20X	0.15X - 1.75X	0.19X - 2.33X	0.29X - 3.50X	0.51X - 6.13X	33.33 - 6.67	20.00 - 0.80
		Field 1/4"	57.14 - 4.59	41.16 - 3.40	27.60 - 2.28	21.05 - 1.72	13.79 - 1.14	7.84 - 0.65	33.33 - 6.67	20.00 - 0.80
		Field 1/3"	85.71 - 6.89	61.73 - 5.10	41.38 - 3.42	31.57 - 2.57	20.69 - 1.71	11.76 - 0.98	33.33 - 6.67	20.00 - 0.80
		Field 1/2"	—	82.32 - 6.80	55.16 - 4.56	42.10 - 3.43	27.58 - 2.28	15.68 - 1.30	33.33 - 6.67	20.00 - 0.80
		Field 2/3"	—	(1) 72.00 - 9.35	75.88 - 6.28	57.89 - 4.72	37.94 - 3.14	21.56 - 1.79	33.33 - 6.67	20.00 - 0.80
0.5X 0.009 - 0.051 N.A. 1-50012	165	Mag.	0.14X - 1.75X	0.20X - 2.40X	0.29X - 3.50X	0.39X - 4.66X	0.58X - 7.00X	1.02X - 12.3X	18.52 - 3.33	6.17 - 0.19
		Field 1/4"	28.57 - 2.28	20.58 - 1.70	13.79 - 1.14	10.25 - 0.86	6.90 - 0.76	3.92 - 0.32	18.52 - 3.33	6.17 - 0.19
		Field 1/3"	42.85 - 3.42	30.87 - 2.55	20.69 - 1.71	15.38 - 1.29	10.34 - 0.86	5.88 - 0.48	18.52 - 3.33	6.17 - 0.19
		Field 1/2"	—	41.16 - 3.40	27.58 - 2.28	20.51 - 1.72	13.79 - 1.14	7.84 - 0.65	18.52 - 3.33	6.17 - 0.19
		Field 2/3"	—	(1) 36.0 - 4.68	37.94 - 3.14	28.20 - 2.36	18.97 - 1.57	10.78 - 0.89	18.52 - 3.33	6.17 - 0.19
0.75X 0.014 - 0.076 N.A. 1-50013	108	Mag.	0.22X - 2.62X	0.29X - 3.50X	0.44X - 5.30X	0.58X - 6.98X	0.87X - 10.50X	1.53X - 18.4X	11.90 - 2.22	2.55 - 0.09
		Field 1/4"	18.18 - 1.52	13.72 - 1.14	9.19 - 0.76	6.89 - 0.57	4.60 - 0.38	2.61 - 0.22	11.90 - 2.22	2.55 - 0.09
		Field 1/3"	27.27 - 2.29	20.58 - 1.70	13.79 - 1.14	10.34 - 0.85	6.89 - 0.57	3.92 - 0.32	11.90 - 2.22	2.55 - 0.09
		Field 1/2"	—	27.44 - 2.27	18.34 - 1.52	13.79 - 1.14	9.19 - 0.76	5.22 - 0.43	11.90 - 2.22	2.55 - 0.09
		Field 2/3"	—	(1) 24.30 - 3.12	25.30 - 2.09	18.96 - 1.57	12.64 - 1.05	7.18 - 0.59	11.90 - 2.22	2.55 - 0.09
None 0.019 - 0.101 N.A.	86	Mag.	0.29X - 3.49X	0.39X - 4.70X	0.58X - 7.00X	0.77X - 9.31X	1.16X - 14.00X	2.03X - 24.5X	9.26 - 1.67	1.39 - 0.05
		Field 1/4"	13.79 - 1.14	10.29 - 0.85	6.90 - 0.57	5.19 - 0.43	3.45 - 0.29	1.97 - 0.16	9.26 - 1.67	1.39 - 0.05
		Field 1/3"	20.69 - 1.72	15.44 - 1.28	10.34 - 0.86	7.79 - 0.64	5.18 - 0.43	2.95 - 0.24	9.26 - 1.67	1.39 - 0.05
		Field 1/2"	—	20.58 - 1.70	13.79 - 1.14	10.39 - 0.86	6.90 - 0.57	3.94 - 0.32	9.26 - 1.67	1.39 - 0.05
		Field 2/3"	—	(1) 18.20 - 2.34	18.97 - 1.57	14.28 - 1.18	9.49 - 0.78	5.42 - 0.44	9.26 - 1.67	1.39 - 0.05
1.5X 0.028 - 0.151 N.A. 1-50014	50	Mag.	0.43X - 5.23X	0.58X - 7.00X	0.87X - 10.50X	1.16X - 14.0X	1.74X - 21.00X	3.05X - 36.8X	6.17 - 1.12	0.64 - 0.02
		Field 1/4"	9.30 - 0.76	6.86 - 0.57	4.60 - 0.38	3.44 - 0.28	2.30 - 0.19	1.31 - 0.11	6.17 - 1.12	0.64 - 0.02
		Field 1/3"	13.95 - 1.14	10.29 - 0.85	6.89 - 0.57	5.17 - 0.44	3.45 - 0.29	1.96 - 0.16	6.17 - 1.12	0.64 - 0.02
		Field 1/2"	—	13.72 - 1.13	9.19 - 0.76	6.89 - 0.57	4.60 - 0.38	2.62 - 0.22	6.17 - 1.12	0.64 - 0.02
		Field 2/3"	—	(1) 12.20 - 1.55	12.64 - 1.05	9.48 - 0.78	6.33 - 0.52	3.60 - 0.23	6.17 - 1.12	0.64 - 0.02
2.0X 0.038 - 0.202 N.A. 1-50015	37	Mag.	0.58X - 6.98X	0.78X - 9.40X	1.16X - 14.00X	1.54X - 18.6X	2.32X - 28.00X	4.06X - 49.0X	4.50 - 0.83	0.35 - 0.01
		Field 1/4"	6.89 - 0.57	5.14 - 0.43	3.45 - 0.29	2.59 - 0.21	1.73 - 0.15	0.98 - 0.08	4.50 - 0.83	0.35 - 0.01
		Field 1/3"	10.34 - 0.85	7.72 - 0.64	5.18 - 0.43	3.89 - 0.32	2.59 - 0.22	1.47 - 0.12	4.50 - 0.83	0.35 - 0.01
		Field 1/2"	—	10.29 - 0.85	6.90 - 0.57	5.19 - 0.43	3.45 - 0.29	1.97 - 0.16	4.50 - 0.83	0.35 - 0.01
		Field 2/3"	—	(1) 9.10 - 1.17	9.49 - 0.78	7.14 - 0.59	4.75 - 0.40	2.71 - 0.22	4.50 - 0.83	0.35 - 0.01

(1) Vignetting occurs at zoom settings less than 0.9X.
 (2) N.A. varies depending on zoom setting.



12X Zoom Performance Specifications

12X Zoom Combinations Lens Attach. + Prime Lens + Adapter	W.D.	System Mag.		N.A. -obj-		Resolve Limit micron		Matching Pixel Size microns		Depth of Field	
		Low Mag.	High Mag.	Low Mag.	High Mag.	Low Mag.	High Mag.	Low Mag.	High Mag.	Low Mag.	High Mag.
0.25x + 12X Zoom + 0.5x	341	0.07	0.87	0.005	0.025	33.33	6.67	2.33	5.8	20.00	0.80
0.25x + 12X Zoom + 0.67x	341	0.10	1.17	0.005	0.025	33.33	6.67	3.33	7.80	20.00	0.80
0.25x + 12X Zoom + 1.0x	341	0.15	1.75	0.005	0.025	33.33	6.67	5.00	11.67	20.00	0.80
0.25x + 12X Zoom + 1.33x	341	0.19	2.33	0.005	0.025	33.33	6.67	6.33	15.54	20.00	0.80
0.25x + 12X Zoom + 2.0x	341	0.29	3.50	0.005	0.025	33.33	6.67	9.67	23.34	20.00	0.80
0.25x + 12X Zoom + 3.5x	341	0.51	6.13	0.005	0.025	33.33	6.67	16.99	40.88	20.00	0.80
0.5x + 12X Zoom + 0.5x	165	0.14	1.75	0.009	0.051	18.52	3.33	2.59	5.82	6.17	0.19
0.5x + 12X Zoom + 0.67x	165	0.19	2.35	0.009	0.051	18.52	3.33	3.60	7.68	6.17	0.19
0.5x + 12X Zoom + 1.0x	165	0.29	3.50	0.009	0.051	18.52	3.33	5.38	11.45	6.17	0.19
0.5x + 12X Zoom + 1.33x	165	0.39	4.66	0.009	0.051	18.52	3.33	7.22	15.51	6.17	0.19
0.5x + 12X Zoom + 2.0x	165	0.58	7.00	0.009	0.051	18.52	3.33	10.74	22.89	6.17	0.19
0.5x + 12X Zoom + 3.5x	165	1.02	12.30	0.009	0.051	18.52	3.33	18.89	40.95	6.17	0.19
0.75x + 12X Zoom + 0.5x	108	0.22	2.62	0.014	0.076	11.90	2.22	2.61	5.81	2.55	0.09
0.75x + 12X Zoom + 0.67x	108	0.29	3.52	0.014	0.076	11.90	2.22	3.45	7.73	2.55	0.09
0.75x + 12X Zoom + 1.0x	108	0.44	5.25	0.014	0.076	11.90	2.22	5.24	11.52	2.55	0.09
0.75x + 12X Zoom + 1.33x	108	0.58	6.98	0.014	0.076	11.90	2.22	6.90	15.49	2.55	0.09
0.75x + 12X Zoom + 2.0x	108	0.87	10.50	0.014	0.076	11.90	2.22	10.35	23.05	2.55	0.09
0.75x + 12X Zoom + 3.5x	108	1.53	18.40	0.014	0.076	11.90	2.22	18.20	40.84	2.55	0.09
None + 12X Zoom + 0.5x	86	0.29	3.49	0.019	0.101	9.26	1.67	2.68	5.82	1.39	0.05
None + 12X Zoom + 0.67x	86	0.39	4.69	0.019	0.101	9.26	1.67	3.42	7.74	1.39	0.05
None + 12X Zoom + 1.0x	86	0.58	7.00	0.019	0.101	9.26	1.67	5.09	11.55	1.39	0.05
None + 12X Zoom + 1.33x	86	0.77	9.31	0.019	0.101	9.26	1.67	7.13	15.54	1.39	0.05
None + 12X Zoom + 2.0x	86	1.16	14.00	0.019	0.101	9.26	1.67	10.17	23.10	1.39	0.05
None + 12X Zoom + 3.5x	86	2.03	24.50	0.019	0.101	9.26	1.67	18.79	40.91	1.39	0.05
1.5x + 12X Zoom + 0.5x	50	0.43	5.23	0.028	0.151	6.17	1.12	2.65	5.85	0.64	0.02
1.5x + 12X Zoom + 0.67x	50	0.58	7.04	0.028	0.151	6.17	1.12	3.45	7.78	0.64	0.02
1.5x + 12X Zoom + 1.0x	50	0.87	10.50	0.028	0.151	6.17	1.12	5.18	11.60	0.64	0.02
1.5x + 12X Zoom + 1.33x	50	1.16	14.00	0.028	0.151	6.17	1.12	7.15	15.68	0.64	0.02
1.5x + 12X Zoom + 2.0x	50	1.74	21.00	0.028	0.151	6.17	1.12	10.74	23.34	0.64	0.02
1.5x + 12X Zoom + 3.5x	50	3.05	36.80	0.028	0.151	6.17	1.12	18.81	41.21	0.64	0.02
2.0x + 12X Zoom + 0.5x	37	0.58	6.98	0.038	0.202	4.50	0.83	2.61	5.79	0.35	0.01
2.0x + 12X Zoom + 0.67x	37	0.78	9.38	0.038	0.202	4.50	0.83	3.42	7.79	0.35	0.01
2.0x + 12X Zoom + 1.0x	37	1.16	14.00	0.038	0.202	4.50	0.83	5.09	11.62	0.35	0.01
2.0x + 12X Zoom + 1.33x	37	1.54	18.60	0.038	0.202	4.50	0.83	6.93	15.43	0.35	0.01
2.0x + 12X Zoom + 2.0x	37	2.32	28.00	0.038	0.202	4.50	0.83	10.17	23.24	0.35	0.01
2.0x + 12X Zoom + 3.5x	37	4.06	49.00	0.038	0.202	4.50	0.83	18.27	40.67	0.35	0.01

Assumptions:

1. Minimum resolvable feature size is half of the threshold line pair limit. Calculation = $1/(3000 \times \text{Lens N.A.})$
2. Matching pixel size is that which will permit the minimum feature size to overlap two pixels. Calculation = $1/2(\text{Feature Size} \times \text{System Magnification})$
3. If the matching pixel size is greater than the camera pixel size, the system is "lens limited."
4. If the matching pixel size is less than the camera pixel size, the system is "camera limited."



12X Internal Co-axial Zoom

Navitar's 12X Zoom with Internal Co-axial Illumination (1-50487) is ideal for applications involving highly reflective surfaces, such as wafers, polished samples, and fluids. Designed to provide even illumination for higher magnification applications, it provides extremely detailed resolution under incident lighting, particularly when a high resolution camera is used. Various illumination sources can be used. For more information on LED or fiber optic illumination, see the Lighting Accessories section.

12X Zoom Field of View Matrix for Internal Co-axial Zoom - 1-50487 (mm)

Lens Attachment	W.D.	Camera Formats/ Parameters	.67X Adapter Low - High	1X Adapter Low - High	1.33X Adapter Low - High	2X Adapter Low - High	3.5X Adapter Low - High
None 0.019 - 0.101 N.A.	86	Mag.	0.39X - 4.70X	0.58X - 7.00X	0.77X - 9.31X	1.16X - 14.00X	2.03X - 24.50X
		Field 1/4"	10.29 - 0.85	6.90 - 0.57	5.19 - 0.43	3.45 - 0.29	1.97 - 0.16
		Field 1/3"	15.44 - 1.28	10.34 - 0.86	7.80 - 0.64	5.18 - 0.43	2.95 - 0.24
		Field 1/2"	20.58 - 1.70	13.79 - 1.14	10.39 - 0.86	6.90 - 0.57	3.94 - 0.32
		Field 2/3"	(1) 16.38 - 2.34	18.97 - 1.57	14.28 - 1.18	9.49 - 0.78	5.41 - 0.45
1.5X 0.028 - 0.151 N.A. 1-50014	50	Mag.	0.58X - 7.00X	0.87 - 10.50X	1.16X - 14.00X	1.74X - 21.00X	3.05X - 36.80X
		Field 1/4"	6.86 - 0.57	4.60 - 0.38	3.45 - 0.29	2.30 - 0.19	1.31 - 0.11
		Field 1/3"	10.29 - 0.85	6.89 - 0.57	5.17 - 0.43	3.45 - 0.29	1.96 - 0.16
		Field 1/2"	13.72 - 1.13	9.19 - 0.76	6.89 - 0.57	4.60 - 0.38	2.62 - 0.22
		Field 2/3"	(1) 10.92 - 1.55	12.64 - 1.05	9.48 - 0.79	6.33 - 0.52	3.61 - 0.30
2.0X 0.038 - 0.202 N.A. 1-50015	37	Mag.	0.78X - 9.40X	1.16X - 14.00X	1.54X - 18.6X	2.32X - 28.00X	4.06X - 49.00X
		Field 1/4"	5.14 - 0.43	3.45 - 0.29	2.59 - 0.22	1.73 - 0.15	0.98 - 0.08
		Field 1/3"	7.72 - 0.64	5.18 - 0.43	3.89 - 0.32	2.59 - 0.22	1.47 - 0.12
		Field 1/2"	10.29 - 0.85	6.90 - 0.57	5.19 - 0.43	3.45 - 0.29	1.97 - 0.16
		Field 2/3"	(1) 8.19 - 1.17	9.49 - 0.78	7.14 - 0.59	4.75 - 0.40	2.71 - 0.22

Notes:
 The internal coax will illuminate a circular area of about 14 mm in diameter. Any field of view larger than 14 mm will have darkened corners.
 Low power lens attachments can be used but produce increasing vignetting.
 (1) Zoom Setting at 1.0=X.
 (2) N.A. varies depending on zoom setting



12X UltraZoom

Combine Infinity-Corrected Objectives for Maximum Resolution and Magnification

The 12X UltraZoom (1-50502) is a high performance system ideal for semiconductor inspection, flow cytometry, or other high magnification applications. Its advanced design offers high resolution and outstanding contrast. This system incorporates infinity corrected objectives to provide long working distances and excellent edge flatness and clarity. The system's resolution exceeds 1,650 lines per mm, depending on the objective used. The UltraZoom is also available with fine focus (1-50504) or with fine focus and co-axial illumination (1-50503).

12X UltraZoom Field of View Matrix for 1-50502, 1-50503 and 1-50504 (mm)

Objective Lens (Mitutoyo) Long W.D.	W.D. (mm)	Camera Formats/ Parameters	1X Adapter Low - High	1.33X Adapter Low - High	2X Adapter Low - High	3.5X Adapter Low - High
5X 0.14 NA* 1-60226	34	Mag.	(1) 3.57X - 16.66X	(2) 3.26X - 22.16X	2.77X - 33.31X	4.80X - 58.30X
		Field 1/4"	1.12 - 0.24	1.22 - 0.18	1.44 - 0.12	0.83 - 0.07
		Field 1/3"	1.68 - 0.36	1.84 - 0.27	2.17 - 0.18	1.25 - 0.10
		Field 1/2"	2.24 - 0.48	2.45 - 0.36	2.89 - 0.24	1.66 - 0.14
		Field 2/3"	—	2.45 - 0.49	3.97 - 0.33	2.29 - 0.19
10X 0.28 NA* 1-60227	33	Mag.	(1) 7.14X - 33.31X	(2) 6.50X - 44.30X	5.54X - 66.63X	9.70X - 116.60X
		Field 1/4"	0.56 - 0.12	0.61 - 0.09	0.72 - 0.06	0.41 - 0.03
		Field 1/3"	0.84 - 0.18	0.92 - 0.13	1.08 - 0.09	0.62 - 0.05
		Field 1/2"	1.12 - 0.24	1.23 - 0.18	1.44 - 0.12	0.82 - 0.07
		Field 2/3"	—	1.23 - 0.25	1.99 - 0.17	1.13 - 0.09
20X 0.42 NA* 1-60228	20	Mag.	(1) 14.28X - 64.63X	(2) 13.10X - 85.96X	11.08X - 133.25X	19.40X - 233.20X
		Field 1/4"	0.28 - 0.06	0.30 - 0.04	0.36 - 0.03	0.21 - 0.02
		Field 1/3"	0.42 - 0.09	0.46 - 0.07	0.54 - 0.04	0.31 - 0.03
		Field 1/2"	0.56 - 0.12	0.61 - 0.09	0.72 - 0.06	0.41 - 0.03
		Field 2/3"	—	0.61 - 0.13	0.99 - 0.08	0.57 - 0.05
50X 0.55 NA* 1-60229	13	Mag.	(1) 35.69X - 166.57X	(2) 40.00X - 221.54X	27.50X - 333.13X	48.10X - 583.00X
		Field 1/4"	0.11 - 0.02	0.10 - 0.02	0.14 - 0.01	0.08 - .006
		Field 1/3"	0.17 - 0.04	0.15 - 0.05	0.22 - 0.02	0.12 - 0.01
		Field 1/2"	0.22 - 0.05	0.20 - 0.04	(2) 0.17 - 0.03	0.16 - 0.01
		Field 2/3"	—	0.20 - 0.05	0.40 - 0.03	0.23 - 0.02

Note: This system is not recommended for use with a 2/3" CCD.

(1) Zoom setting at 1.5X.

(2) Zoom setting at 1.0X.

*N.A. at full zoom. N.A. varies with zoom setting.