

Zoom 6000 High Mag Zoom Lens



- Dynamic magnification range of 0.09-393X offers incredible versatility.
- High contrast images and vivid colors help your equipment perform better.
- 0.01-125.68 mm field coverage allows you to view a wide range of parts.
- Working distance can be varied from 34 to 390 mm.
- Add infinity corrected objective lenses to achieve unmatched edge flatness and clarity.

Zoom 6000



Flexibility by Design

A Workhorse to Fit Nearly Any Application

With a diverse selection of body tubes, accessory optics, motorized configurations, and lighting techniques, the Zoom 6000 is Navitar's workhorse with unbeatable versatility. This modular zoom lens system incorporates Navitar's world-renowned optics. This "building block design" can be configured to fit nearly any application.

6.5:1 Zoom Ratio, Long Working Distance and Large Field of View

The parfocal optical system of the Zoom 6000 has a 6.5:1 zoom ratio, a 0.7X to 4.5X zoom range, and total magnification (depending on lens adapters and attachments used) of 0.09X to 393X. The working distance can be varied from 34 mm (1.3") to 390 mm (15.4"). The achievable field of view can vary from 0.01 mm to 125.68 mm.



Unsurpassed Optical Performance

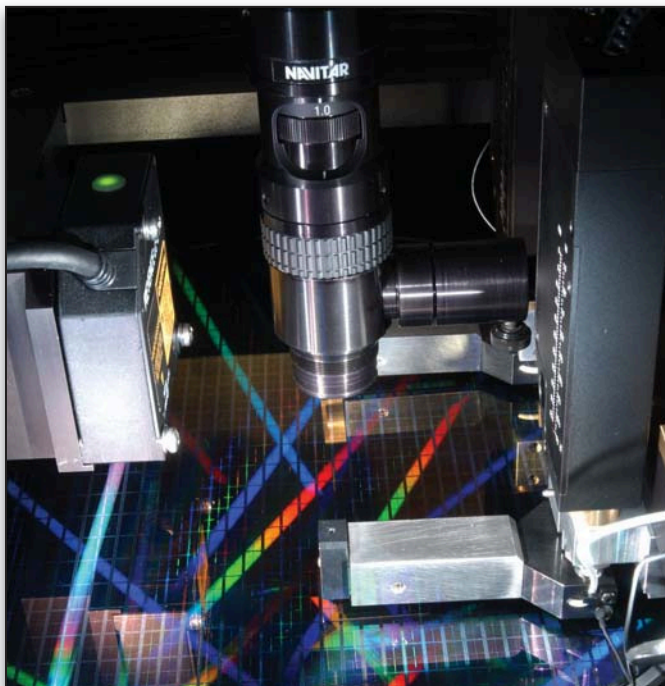
The optical system of the Zoom 6000 produces images of the finest optical quality. Chromatic aberration and distortion have been virtually eliminated. With the Zoom 6000 lenses, images are crisp and clear and display optimum contrast with minimum flare over the entire field of view.

Manual or Detented for Calibrated Repeatability

The Zoom 6000 lenses are available in a manual design, as well as a detented version for calibrated repeatability.

Motorized for Automation

If you are building highly automated systems, Navitar can offer you a wide selection of motorized lenses and control equipment. Please see the motorized section of the catalog.



Key Terms for Matrix Charts

Depth of Field

The distance allowing acceptable image definition to be maintained without refocusing.

Distortion

Distortion is a variation in magnification across the field of view.

Field

Field of view for respective camera format (normally measured diagonally).

Magnification

A measure of the apparent differences in size between the object and image.

Matching Pixel Size

Matching pixel size is that which will permit the minimum feature size to overlap two pixels.

MTF (lp/mm)

A measurement of the ability of an optical system to reproduce (transfer) various levels of detail from the object to the image, as shown by the degree of contrast (modulation) in the image.

N.A. Image (high or low mag.)

Measurement at the image point of the largest cone of light rays that are exiting the optical system.

N.A. Object (high or low mag.)

Measurement at the object point of the largest cone or number of light rays that are entering the optical system.

Object to Image Distance (O-I)

Total distance from the object to the sensor inside the camera.

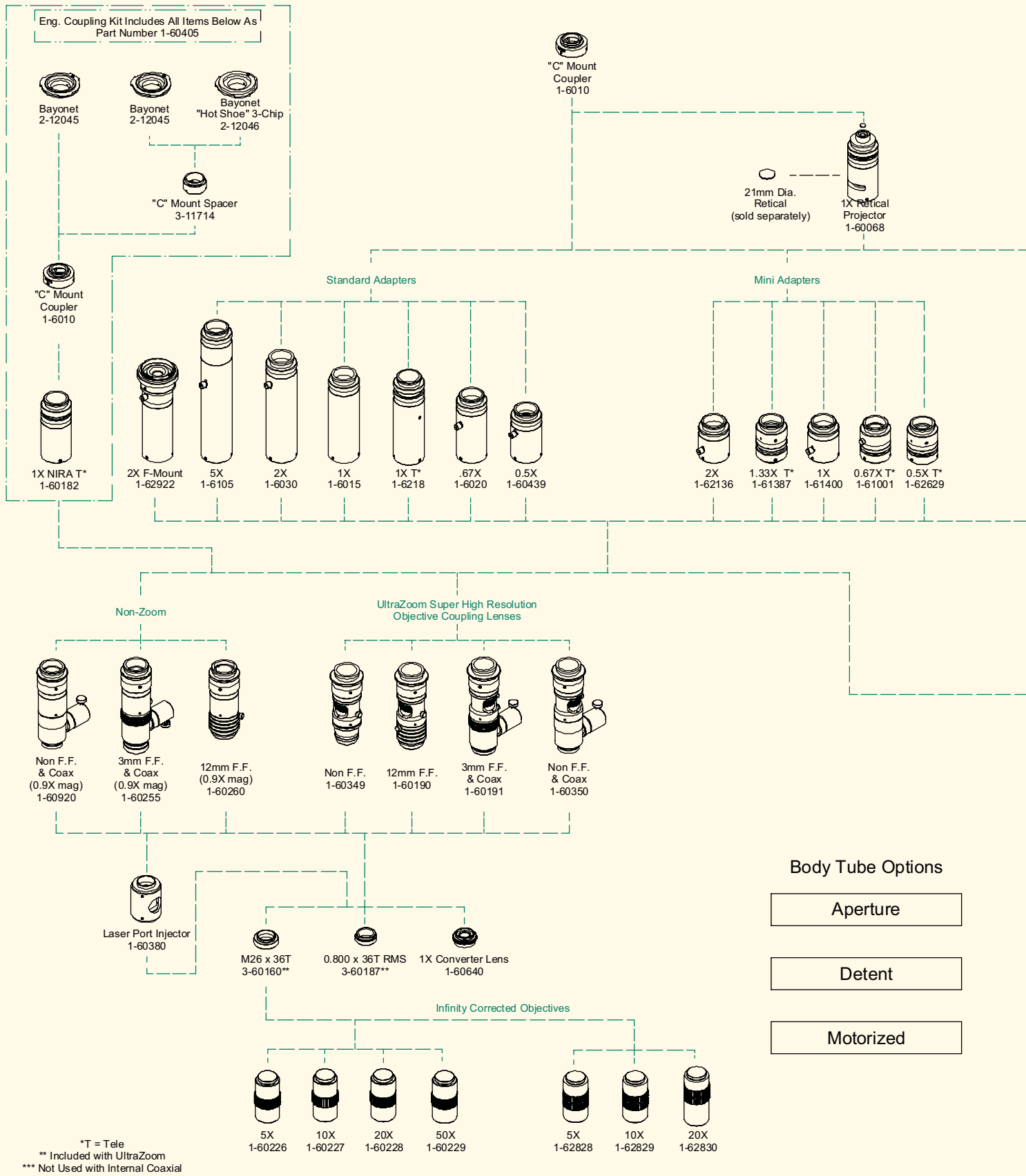
Resolvable Features (microns)

Measurement of lens system's ability to image closely spaced points, lines and object surfaces as separate entities.

Working Distance (W.D.)

Clearance between object and lowest mechanical part of the system.

Zoom 6000 System Diagram



23mm
Microscope
Eye Piece
(sold separately)

Eye Piece Holder
1-6050



Adapter Plates

(65.6mm)
MM11, MM22
1-60141

(76mm)
1-60052

(82mm)
1-9620

(84mm)
1-6179

Mounting Clamp
1-6270

Stand (82mm)
1-6206

B&L/Leica Adapter Plate
1-6055

Short Adapters

3.5X
1-62831

2X
1-6233

1X
1-6245

Non-Inv. Right Angle Adapters

5X
1-60188

2X
1-60185

1X
1-60175

1X T*
1-60182

.67X
1-60172

Right Angle Adapters

5X
1-6187

2X
1-6120

1X
1-6118

1X T*
1-61997

0.71X
1-60060

2X F-Mount
1-63218

NIRA Mount w/Prism
1-60165

Mount
1-6080

Analyzer
1-60816

Aux. Viewing Port
1-60370

Zoom Lenses

12mm F.F.
1-60135

3mm F.F.
1-6232

6.5X Non F.F.
1-6265

3mm F.F.
Int. Coax
1-60123

NIRA Viewers***

1.5X
(7mm
Working Distance)
1-60869

0.75X
(69mm
Working Distance)
1-61217

0.5X
(131mm
Working Distance)
1-61595

Lens Attachments

0.25X
1-6044

0.5X
1-60110

0.75X
1-60111

1.5X
1-60112

2X
1-60113

RA Lens Attachment
1-62866

1/4 Wave Plate Assembly
1-60981



Zoom 6000

Zoom 6000 Field of View Matrix (in mm at nominal W.D.)

Lens Attachment	W.D. (mm)	Camera Format/Parameters	.5X Adapter Low - High	.67X Adapter Low - High	1X Adapter Low - High	1.33X Adapter Low - High	2X Adapter Low - High	3.5X Adapter Low - High	5X Adapter Low - High	Resolve Limit (microns) Low-High	Depth of Field (mm) Low-High
0.25X 0.006 - 0.018 1-6044	356 (nominal) 220-390 (1) W.D. range	Mag.	0.09X - 0.56X	0.12X - 0.75X	0.18X - 1.13X	.24X - 1.5X	0.35X - 2.25X	.63X - 3.95X	0.88X - 5.62X	27.78 - 9.26	13.89 - 1.54
		Field 1/4"	45.70 - 7.12	34.03 - 5.33	22.85 - 3.56	17.18 - 2.68	11.42 - 1.78	6.53 - 1.02	4.54 - 0.72	27.78 - 9.26	13.89 - 1.54
		Field 1/3"	68.64 - 10.64	51.12 - 8.04	34.32 - 5.32	25.80 - 4.0	17.16 - 2.66	9.8 - 1.52	6.88 - 1.08	27.78 - 9.26	13.89 - 1.54
		Field 1/2"	91.36 - 14.16	68.06 - 10.66	45.68 - 7.08	34.34 - 5.32	22.84 - 3.54	13.05 - 2.02	9.12 - 1.44	27.78 - 9.26	13.89 - 1.54
		Field 2/3"	91.40 - 19.52	93.62 - 14.66	62.84 - 9.76	47.25 - 7.34	31.42 - 4.88	17.95 - 2.79	12.56 - 1.96	27.78 - 9.26	13.89 - 1.54
0.5X 0.011 - 0.035 1-60110	175 (nominal) 143-187 (1) W.D. range	Mag.	0.18X - 1.13X	0.24X - 1.50X	0.35X - 2.25X	.46X - 2.99X	0.70X - 4.50X	1.22X - 7.87X	1.75X - 11.25X	15.15 - 4.76	4.13 - 0.41
		Field 1/4"	22.85 - 3.56	17.02 - 2.66	11.42 - 1.78	8.59 - 1.34	5.71 - 0.89	3.26 - .51	2.28 - 0.36	15.15 - 4.76	4.13 - 0.41
		Field 1/3"	34.32 - 5.32	25.56 - 4.0	17.16 - 2.67	12.90 - 2.01	8.58 - 1.33	4.90 - 0.76	3.43 - 0.53	15.15 - 4.76	4.13 - 0.41
		Field 1/2"	45.68 - 7.08	34.03 - 5.33	22.85 - 3.56	17.18 - 2.68	11.42 - 1.77	6.58 - 1.02	4.57 - 0.71	15.15 - 4.76	4.13 - 0.41
		Field 2/3"	45.70 - 9.76	46.81 - 7.33	31.43 - 4.89	23.63 - 3.68	15.71 - 2.44	8.98 - 1.40	6.29 - 0.98	15.15 - 4.76	4.13 - 0.41
0.75X 0.017 - 0.053 1-60111	113 (nominal) 100-119 (1) W.D. range	Mag.	0.27X - 1.69X	0.35X - 2.25X	0.53X - 3.38X	.70X - 4.49X	1.05X - 6.75X	1.85X - 11.83X	2.63X - 16.88X	9.80 - 3.14	1.73-0.18
		Field 1/4"	15.22 - 2.38	11.34 - 1.78	7.61 - 1.19	5.72 - .89	3.81 - 0.59	2.17 - .34	1.52 - 0.24	9.80 - 3.14	1.73-0.18
		Field 1/3"	22.86 - 3.56	17.04 - 2.67	11.43 - 1.78	8.59 - 1.34	5.72 - 0.89	3.26 - .51	2.29 - 0.35	9.80 - 3.14	1.73-0.18
		Field 1/2"	30.46 - 4.74	22.69 - 3.56	15.23 - 2.37	11.45 - 1.78	7.62 - 1.19	4.35 - .68	3.05 - 0.47	9.80 - 3.14	1.73-0.18
		Field 2/3"	30.50 - 6.52	31.21 - 4.89	20.95 - 3.26	15.75 - 2.45	10.48 - 1.63	5.98 - .93	4.19 - 0.65	9.80 - 3.14	1.73-0.18
None 0.023 - 0.071	92 (nominal) 81-93 (1) W.D. range	Mag.	0.35X - 2.25X	0.47X - 3.00X	0.70X - 4.50X	.93X - 5.89X	1.40X - 9.00X	2.45X - 15.75X	3.50X - 22.50X	7.25 - 2.35	0.95 - 0.10
		Field 1/4"	11.42 - 1.78	8.51 - 1.33	5.71 - 0.89	4.29 - .67	2.86 - 0.45	1.63 - .25	1.14 - 0.18	7.25 - 2.35	0.95 - 0.10
		Field 1/3"	17.16 - 2.67	12.77 - 2.01	8.58 - 1.33	6.45 - 1.0	4.29 - 0.67	2.45 - .38	1.72 - 0.27	7.25 - 2.35	0.95 - 0.10
		Field 1/2"	22.85 - 3.56	17.01 - 2.67	11.42 - 1.77	8.59 - 1.33	5.71 - 0.89	3.26 - .50	2.28 - 0.36	7.25 - 2.35	0.95 - 0.10
		Field 2/3"	22.90 - 4.89	23.40 - 3.65	15.71 - 2.44	11.81 - 1.83	7.86 - 1.22	4.49 - .70	3.14 - 0.49	7.25 - 2.35	0.95 - 0.10
1.5X 0.034 - 0.106 1-60112	51 (nominal) 48-52 (1) W.D. range	Mag.	0.53X - 3.38X	0.71X - 4.50X	1.05X - 6.75X	1.40 - 8.98	2.10X - 13.50X	3.67X - 23.62X	5.25X - 33.75X	4.90 - 1.57	0.43 - 0.04
		Field 1/4"	7.61 - 1.19	5.67 - 0.89	3.81 - 0.59	2.86 - .44	1.91 - 0.30	1.09 - .17	0.76 - 0.12	4.90 - 1.57	0.43 - 0.04
		Field 1/3"	11.43 - 1.78	8.52 - 1.33	5.72 - 0.89	4.3 - .67	2.86 - 0.44	1.63 - .25	1.14 - 0.18	4.90 - 1.57	0.43 - 0.04
		Field 1/2"	15.23 - 2.37	11.34 - 1.77	7.62 - 1.19	5.73 - .89	3.81 - 0.59	2.18 - .34	1.52 - 0.24	4.90 - 1.57	0.43 - 0.04
		Field 2/3"	15.00 - 3.26	15.60 - 2.44	10.48 - 1.63	7.88 - 1.22	5.24 - 0.81	2.99 - .46	2.10 - 0.33	4.90 - 1.57	0.43 - 0.04
2.0X 0.040 - 0.142 1-60113	36 (nominal) 34-37 (1) W.D. range	Mag.	0.70X - 4.50X	0.94X - 6.00X	1.40X - 9.00X	1.86X - 11.97X	2.80X - 18.00X	4.9X - 31.5X	7.00X - 45.00X	3.62 - 1.17	0.24 - 0.02
		Field 1/4"	5.71 - 0.89	4.26 - 0.67	2.86 - 0.45	2.15 - .34	1.43 - 0.23	.82 - .13	0.57 - 0.09	3.62 - 1.17	0.24 - 0.02
		Field 1/3"	8.58 - 1.33	6.39 - 1.00	4.29 - 0.67	3.22 - .50	2.15 - 0.33	1.22 - .19	0.86 - 0.13	3.62 - 1.17	0.24 - 0.02
		Field 1/2"	11.42 - 1.77	8.51 - 1.33	5.71 - 0.89	4.29 - .67	2.86 - 0.44	1.63 - .25	1.14 - 0.18	3.62 - 1.17	0.24 - 0.02
		Field 2/3"	11.40 - 2.44	11.70 - 1.83	7.86 - 1.22	5.91 - .92	3.93 - 0.61	2.24 - .35	1.57 - 0.24	3.62 - 1.17	0.24 - 0.02

NOTES:

The above fields of view are measured diagonally in millimeters (Horizontal = Diagonal x 0.8 and Vertical = Diagonal x 0.6).

(1) Working distance range when using 12 mm fine focus. Field of view will change with shorter or longer working distances.

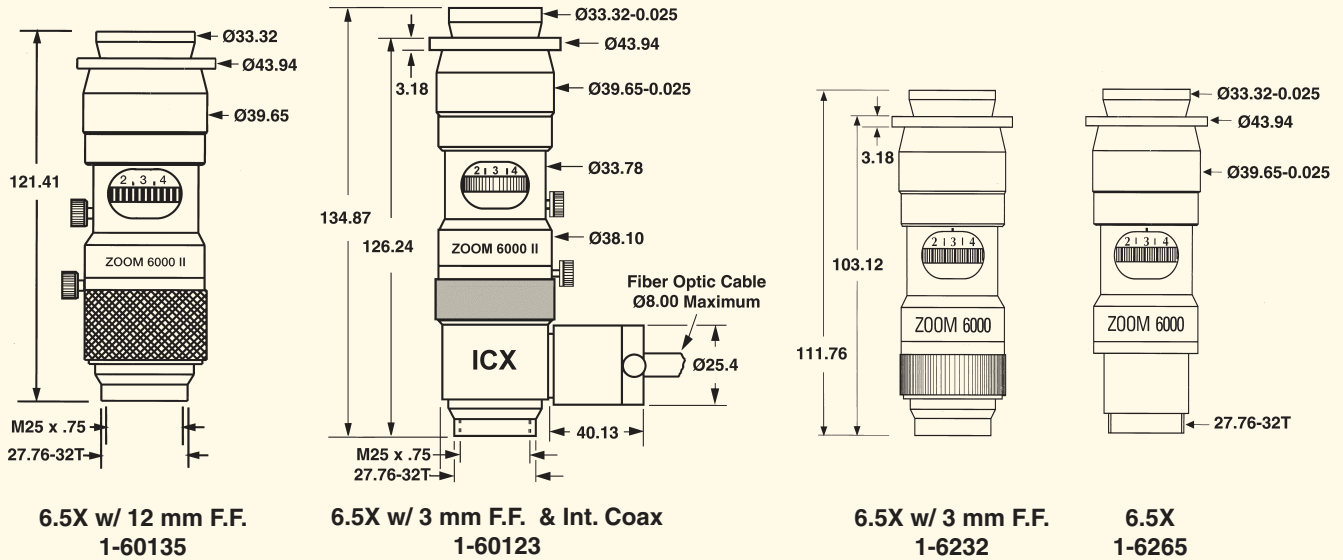
N.A. varies depending in system magnification.

Zoom 6000 System Dimensions

*All measurements are in mm unless otherwise specified.

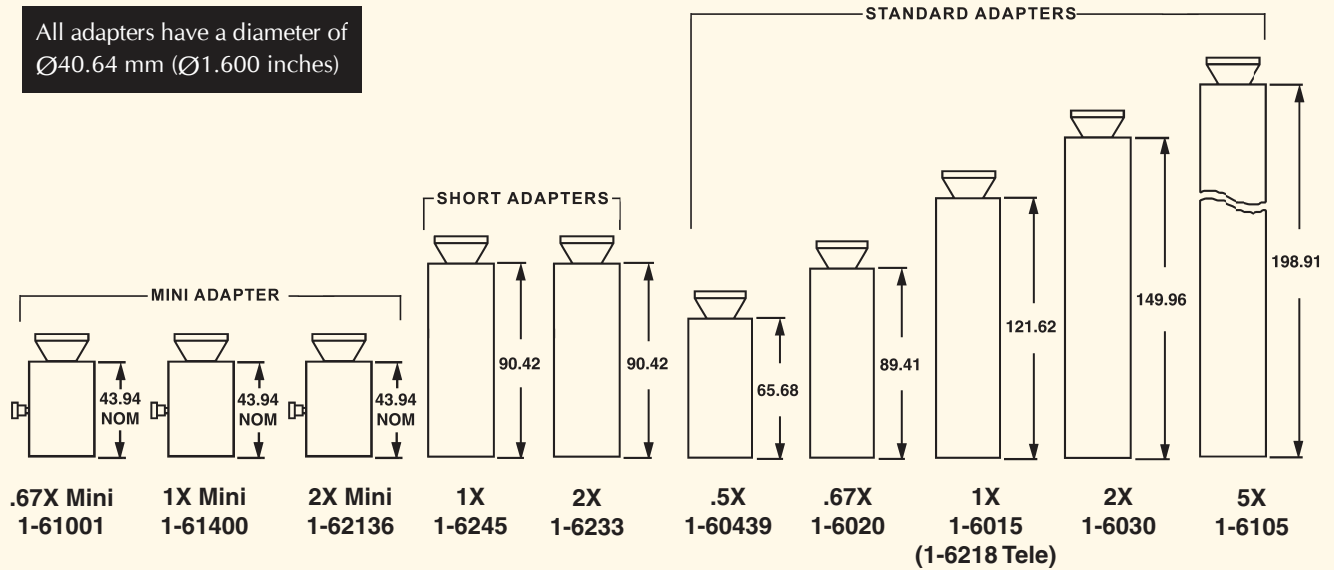
Navitar offers a wide variety of lenses, adapters and attachments. Dimensions of a few examples are provided here. For a complete listing of lens dimensions, please visit www.machinevision.navitar.com.

Lenses*

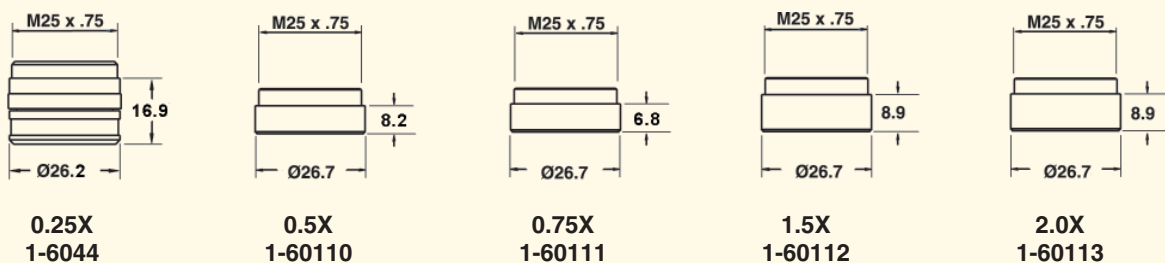


Adapters*

All adapters have a diameter of $\varnothing 40.64$ mm ($\varnothing 1.600$ inches)



Attachments*



Zoom 6000 Performance Specifications

Zoom 6000 Combinations Lens Attachment + Prime Lens + Adapter	W.D.	System Magnification		N.A.-obj-		Resolve Limit (microns)		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 + 6.5X Zoom + 0.5x	356	0.09	0.56	0.006	0.018	27.78	9.26	2.50	5.19	13.89	1.54
0.25x + 6.5X Zoom + 0.67x	356	0.12	0.75	0.006	0.018	27.78	9.26	3.33	6.95	13.89	1.54
0.25x + 6.5X Zoom + 1.0x	356	0.18	1.13	0.006	0.018	27.78	9.26	5.00	10.46	13.89	1.54
0.25x + 6.5X Zoom + 1.33x	356	0.23	1.51	0.006	0.018	27.78	9.26	6.65	13.91	13.89	1.54
0.25x + 6.5X Zoom + 2.0x	356	0.35	2.25	0.006	0.018	27.78	9.26	9.72	20.84	13.89	1.54
0.25x + 6.5X Zoom + 3.5x	356	0.61	3.98	0.006	0.018	27.78	9.26	17.50	36.61	13.89	1.54
0.25x + 6.5X Zoom + 5.0x	356	0.88	5.62	0.006	0.018	27.78	9.26	24.45	52.04	13.89	1.54
0.5x + 6.5X Zoom + 0.5x	175	0.18	1.13	0.011	0.035	15.15	4.76	2.73	5.38	4.13	0.41
0.5x + 6.5X Zoom + 0.67x	175	0.23	1.50	0.011	0.035	15.15	4.76	3.48	7.14	4.13	0.41
0.5x + 6.5X Zoom + 1.0x	175	0.35	2.25	0.011	0.035	15.15	4.76	5.30	10.71	4.13	0.41
0.5x + 6.5X Zoom + 1.33x	175	0.47	3.03	0.011	0.035	15.15	4.76	7.05	14.24	4.13	0.41
0.5x + 6.5X Zoom + 2.0x	175	0.70	4.50	0.011	0.035	15.15	4.76	10.61	21.42	4.13	0.41
0.5x + 6.5X Zoom + 3.5x	175	1.22	7.93	0.011	0.035	15.15	4.76	18.55	37.49	4.13	0.41
0.5x + 6.5X Zoom + 5.0x	175	1.75	11.25	0.011	0.035	15.15	4.76	26.51	53.55	4.13	0.41
0.75x + 6.5X Zoom + 0.5x	113	0.26	1.69	0.017	0.053	9.80	3.14	2.55	5.32	1.73	0.18
0.75x + 6.5X Zoom + 0.67x	113	0.35	2.25	0.017	0.053	9.80	3.14	3.43	7.08	1.73	0.18
0.75x + 6.5X Zoom + 1.0x	113	0.53	3.38	0.017	0.053	9.80	3.14	5.20	10.63	1.73	0.18
0.75x + 6.5X Zoom + 1.33x	113	0.70	4.54	0.017	0.053	9.80	3.14	6.92	14.13	1.73	0.18
0.75x + 6.5X Zoom + 2.0x	113	1.05	6.75	0.017	0.053	9.80	3.14	10.30	21.23	1.73	0.18
0.75x + 6.5X Zoom + 3.5x	113	1.86	12.06	0.017	0.053	9.80	3.14	18.20	37.21	1.73	0.18
0.75x + 6.5X Zoom + 5.0x	113	2.63	16.88	0.017	0.053	9.80	3.14	25.74	53.09	1.73	0.18
None + 6.5X Zoom + 0.5x	92	0.35	2.25	0.023	0.071	7.25	2.35	2.54	5.28	0.95	0.10
None + 6.5X Zoom + 0.67x	92	0.47	3.00	0.023	0.071	7.25	2.35	3.41	7.04	0.95	0.10
None + 6.5X Zoom + 1.0x	92	0.70	4.50	0.023	0.071	7.25	2.35	5.08	10.55	0.95	0.10
None + 6.5X Zoom + 1.33x	92	0.93	6.05	0.023	0.071	7.25	2.35	6.76	14.03	0.95	0.10
None + 6.5X Zoom + 2.0x	92	1.40	9.00	0.023	0.071	7.25	2.35	10.15	21.11	0.95	0.10
None + 6.5X Zoom + 3.5x	92	2.45	15.93	0.023	0.071	7.25	2.35	17.78	36.93	0.95	0.10
None + 6.5X Zoom + 5.0x	92	3.50	22.50	0.023	0.071	7.25	2.35	25.38	52.76	0.95	0.10
1.5x + 6.5X Zoom + 0.5x	51	0.53	3.38	0.034	0.106	4.90	1.57	2.60	5.32	0.43	0.04
1.5x + 6.5X Zoom + 0.67x	51	0.70	4.50	0.034	0.106	4.90	1.57	3.43	7.09	0.43	0.04
1.5x + 6.5X Zoom + 1.0x	51	1.05	6.75	0.034	0.106	4.90	1.57	5.15	10.63	0.43	0.04
1.5x + 6.5X Zoom + 1.33	51	1.40	9.08	0.034	0.106	4.90	1.57	6.85	14.14	0.43	0.04
1.5x + 6.5X Zoom + 2.0x	51	2.10	13.50	0.034	0.106	4.90	1.57	10.29	21.26	0.43	0.04
1.5x + 6.5X Zoom + 3.5x	51	3.68	23.89	0.034	0.106	4.90	1.57	18.03	37.21	0.43	0.04
1.5x + 6.5X Zoom + 5.0x	51	5.25	33.75	0.034	0.106	4.90	1.57	25.73	53.16	0.43	0.04
2.0x + 6.5X Zoom + 0.5x	36	0.70	4.50	0.046	0.142	3.62	1.17	2.54	5.29	0.24	0.02
2.0x + 6.5X Zoom + 0.67x	36	0.94	6.00	0.046	0.142	3.62	1.17	3.41	7.05	0.24	0.02
2.0x + 6.5X Zoom + 1.0x	36	1.40	9.00	0.046	0.142	3.62	1.17	5.08	10.58	0.24	0.02
2.0x + 6.5X Zoom + 1.33	36	1.86	12.10	0.046	0.142	3.62	1.17	6.76	14.07	0.24	0.02
2.0x + 6.5X Zoom + 2.0x	36	2.80	18.00	0.046	0.142	3.62	1.17	10.15	21.15	0.24	0.02
2.0x + 6.5X Zoom + 3.5x	36	4.90	31.85	0.046	0.142	3.62	1.17	17.78	37.03	0.24	0.02
2.0x + 6.5X Zoom + 5.0x	36	7.00	45.00	0.046	0.142	3.62	1.17	25.38	52.88	0.24	0.02

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."

Zoom 6000 Distortion Percentage

This data is plus-minus calibrated distortion based on best-fit magnification.

Magnification	% Distortion
0.700	0.113
0.800	0.093
0.900	0.071
1.000	0.051
1.100	0.036
1.250	0.022
1.500	0.008
1.750	0.002
2.000	0.002
2.250	0.004
2.500	0.007
2.750	0.010
3.000	0.009
3.250	0.010
3.499	0.012
3.749	0.014
3.999	0.016
4.249	0.019
4.499	0.021

Zoom 6000 Distortion Values Over Zoom Range

