12 X Zoom
High Mag Zoom Lenses

- Incredible 12:1 Zoom ratio with dynamic magnification range of 0.07X-583X.
- Telecentric attachment gives you the world's first parfocal telecentric zoom lens with field coverage up to 50 mm.
- Increased resolution with 0.018-0.1 N.A.
- Variable working distance from 32 to 341 mm.
- Field of view from 0.006 mm to 85.71 mm with attachments.
- Unmatched edge flatness and clarity.
- Works with 1/4″, 1/3″, 1/2″ and 2/3″ format cameras.
- The 12X Zoom System is compatible with Zoom 6000 adapter tubes.

NAVITAR®

12X Zoom

Raising the Standard for Optical Excellence

The Highest Combination of Zoom Range and Resolution in a State-of-the-Art Optical System

Navitar's 12X Zoom is the next generation in video zoom optics. With a zoom ratio of 12:1, a zoom range of 0.58X to 7X and a dynamic magnification range of .07 to 583X, the 12X is the only single lens system to provide such a high combination of zoom range and resolution. This outstanding combination of video clarity and zoom range, coupled with unprecedented field coverage, means that you will now be able to view a wider range of parts with a single video inspection system.

Flexible by Design

The 12X Zoom system is designed on a modular basis, offering optical quality and mechanical flexibility. This interchangeable design, combined with a wide range of lens adapters and attachments, allows you to easily choose the magnification, field of view and working distance that best suit your viewing needs. In fact, the 12X Zoom system is even compatible with existing Zoom 6000 adapters.

All 12X Zoom models have a 12X parfocal zoom lens system with a high N.A. (0.018 - 0.1) to achieve higher resolution and

improved contrast. Working distance can be varied from 32 mm (1.25″) to 341 mm (13.4″) and fields of view can be achieved from 0.006 mm to 85.71 mm.

Designed to Increase Productivity

The 12X Zoom system is ideal for use in the inspection of a wide range of products, such as semiconductor chips, PC boards and life science applications. It increases productivity by eliminating the need to change components to view a wider range of parts. It's easy to use and displays crisp, clear images on any monitor for individual or group viewing.

Unbeatable Accuracy

Our 12X Zoom delivers unbeatable accuracy and repeatability for even the toughest die bonding, life science, and FPD inspection applications. Superb Navitar optics deliver remarkably high contrast, high resolution video images. The 12:1 zoom ratio provides an incredible magnification range that allows both high magnification for precision measurement and inspection, as well as low magnification for a wider field of view. Bonding, probing, scribing and aligning applications can all be performed better and more accurately than with any other zoom lens on the market.

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.

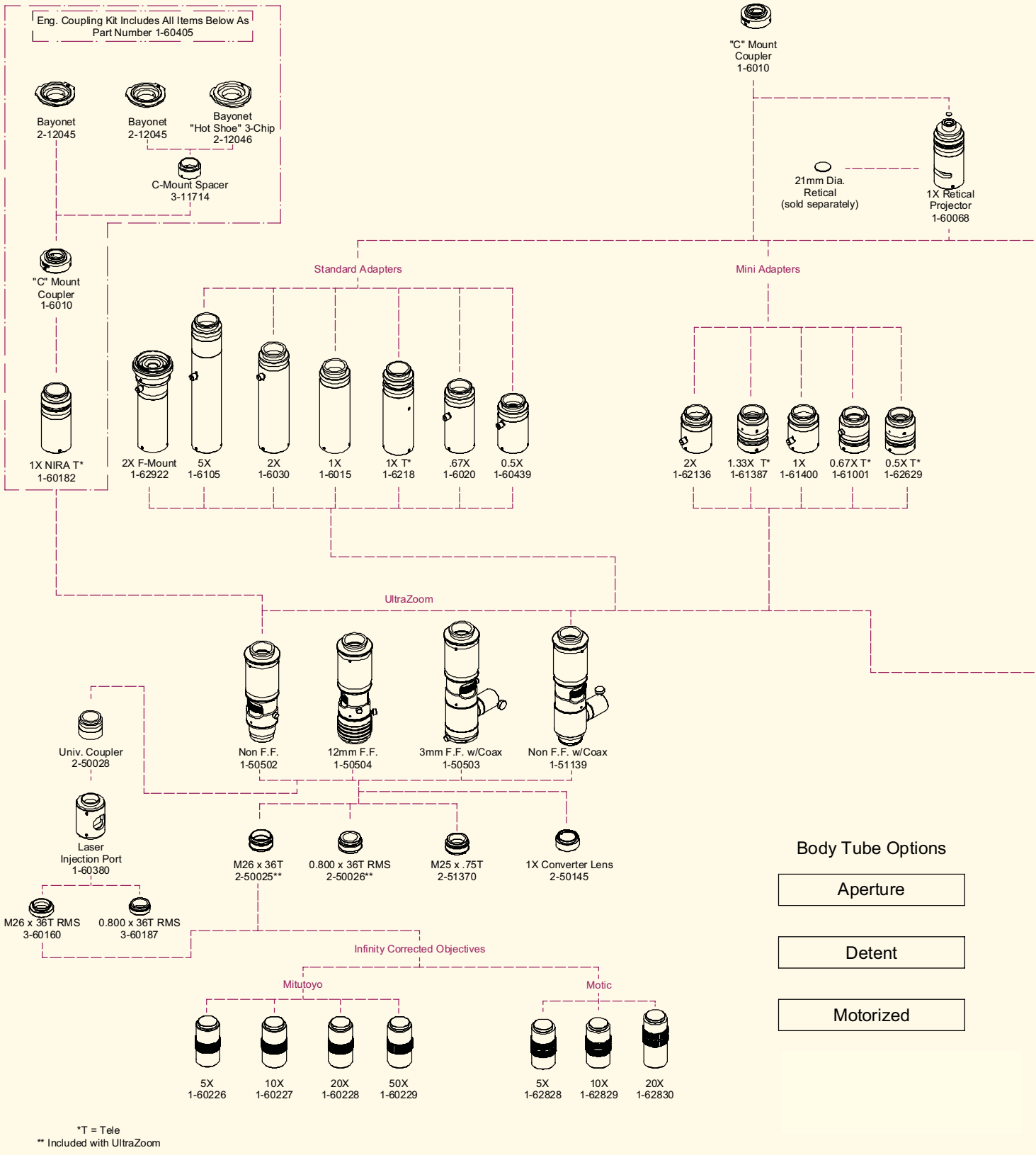
N.A. Object (high or low mag.)
Measurement at the object point of the largest cone or number of light rays that are entering the optical system.

Object to Image Distance (O-I)
Total distance from the object to the sensor inside the camera.

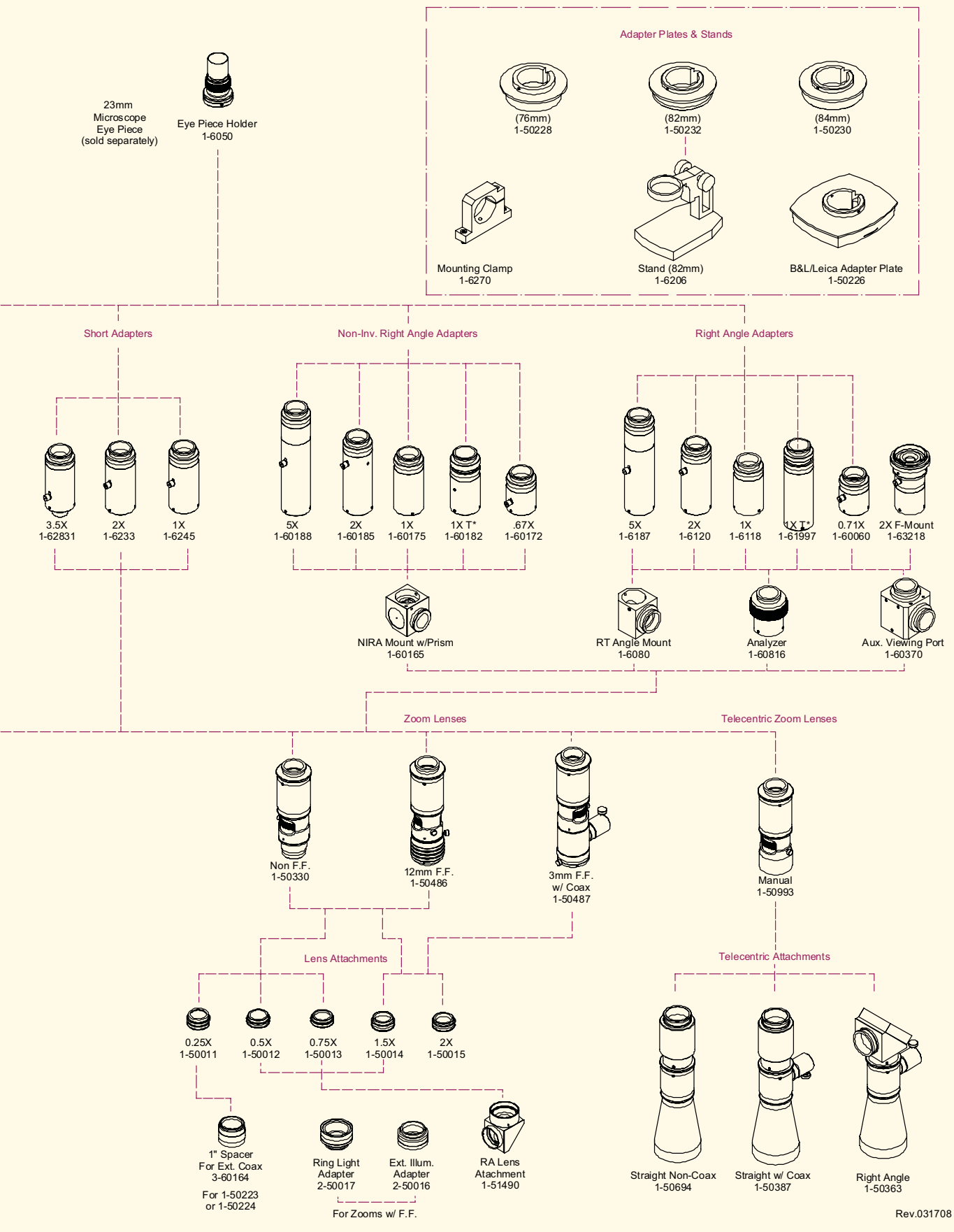
Resolvable Features (microns)
Measurement of lens system's ability to image closely spaced points, lines and object surfaces as separate entities.

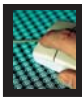
Working Distance (W.D.)
Clearance between object and lowest mechanical part of the system.

12X Zoom System Diagram



*T = Tele
** Included with UltraZoom


23mm
Microscope
Eye Piece
(sold separately)
Eye Piece Holder
1-6050
Adapter Plates & Stands
(76mm)
1-50228
(82mm)
1-50232
(84mm)
1-50230
Mounting Clamp
1-6270
Stand (82mm)
1-6206
B&L/Leica Adapter Plate
1-50226
Short Adapters
Non-Inv. Right Angle Adapters
Right Angle Adapters
3.5X
1-62831
2X
1-6233
1X
1-6245
5X
1-60188
2X
1-60185
1X
1-60175
1X T*
1-60182
.67X
1-60172
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
RT Angle Mount
1-6080
Analyzer
1-60816
Aux. Viewing Port
1-60370
Zoom Lenses
Telecentric Zoom Lenses
Non F.F.
1-50330
12mm F.F.
1-50486
3mm F.F.
w/ Coax
1-50487
Manual
1-50993
Lens Attachments
Telecentric Attachments
0.25X
1-50011
0.5X
1-50012
0.75X
1-50013
1.5X
1-50014
2X
1-50015
1" Spacer
For Ext. Coax
3-60164
For 1-50223
or 1-50224
Ring Light
Adapter
2-50017
Ext. Illum.
Adapter
2-50016
For Zooms w/ F.F.
RA Lens
Atachment
1-51490
Straight Non-Coax
1-50694
Straight w/ Coax
1-50387
Right Angle
1-50363
Rev.031708



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	3.5 Adapter Low - High	Resolve Limit (microns) Low - High	Depth of Field (mm) Low - High
0.25X (2)0.005 - 0.025 NA 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 - 1.79	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. 1-51473	32	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

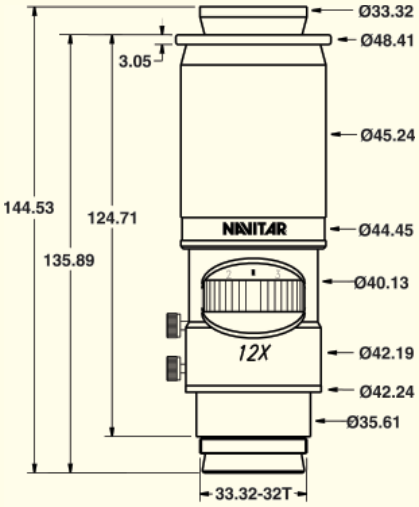
(1) Vignetting occurs at zoom settings less than 0.9X.
(2) N.A. varies depending on zoom setting.

12X Zoom System Dimensions

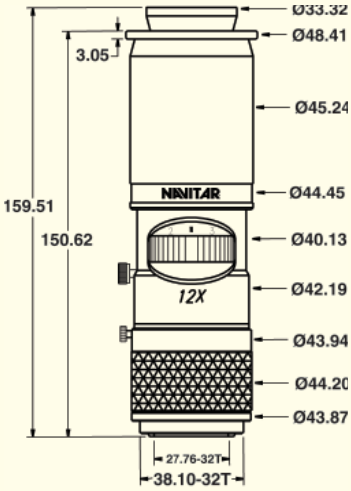
Navitar offers a wide variety of lenses, adapters and attachments. Dimensions of a few examples are provided here. For a complete listing of lens dimensions, please visit www.machinevision.navitar.com.

*All measurements are in mm unless otherwise specified.

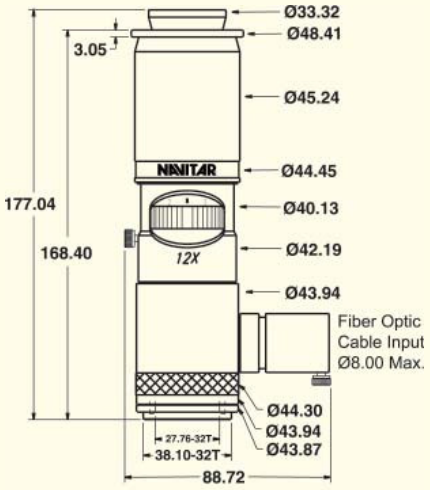
Lenses*



12X Zoom Non F.F.
1-50330



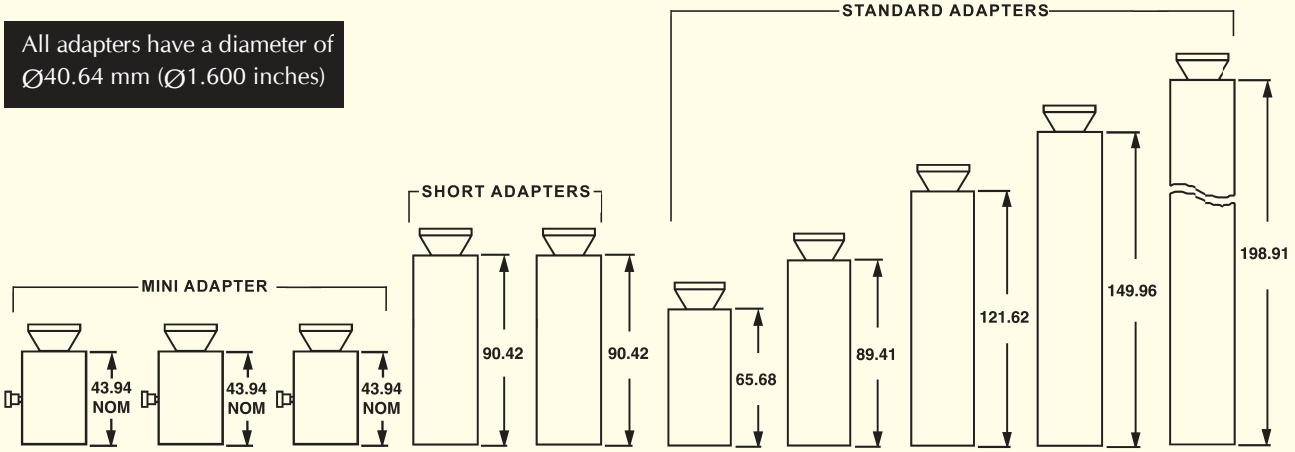
12X Zoom w/ 12 mm F.F.
1-50486



12X Zoom w/ 3 mm F.F. & Coax
1-50487

Adapters*

All adapters have a diameter of Ø40.64 mm (Ø1.600 inches)



.67X Mini
1-61001

1X Mini
1-61400

2X Mini
1-62136

1X
1-6245

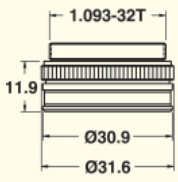
2X
1-6233

.67X
1-6020

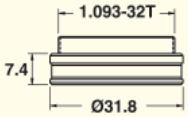
1X
1-6015
(1-6218 Tele)

2X
1-6030

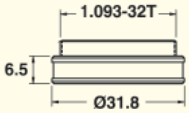
Attachments*



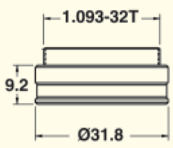
0.25X
1-50011



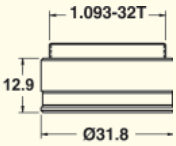
0.5X
1-50012



0.75X
1-50013



1.5X
1-50014



2X
1-51473

12X Zoom Performance Specifications

12X Zoom Combinations	W.D.	System Mag.		N.A. -obj-		Resolve Limit micron		Matching Pixel Size microns		Depth of Field	
Lens Attach. + Prime Lens + Adapter		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	32	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	32	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	32	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	32	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	32	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	32	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 x Lens N.A.)*
2. *Matching pixel size is that which will permit the minimum feature size to overlap two pixels. Calculation = 1/2(Feature Size x 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 Zoom Distortion %

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

Mag	% Distortion
0.580	0.109
0.600	0.107
0.650	0.100
0.700	0.089
0.800	0.077
0.900	0.068
1.000	0.060
1.250	0.048
1.500	0.042
1.750	0.039
2.000	0.038
2.250	0.037
2.500	0.037
2.750	0.038
3.000	0.039
3.250	0.041
3.500	0.042
3.750	0.044
4.000	0.037
4.499	0.040
4.999	0.044
5.499	0.047
5.998	0.051
6.497	0.057
6.995	0.062