Precise Eye
High Mag Fixed Lenses

- High resolution, diffraction-limited f/4.5 optical quality for high precision measurement and inspection.
- Long working distance makes illumination and handling easier.
- Compact size.
- Coaxial lighting available for shadow free illumination.
- Compatible with high-magnification infinity corrected objectives (5X, 10X, 20X, 50X).
- Mechanically stable for the most demanding vibration environments.
- Modular design for flexibility.
- Optics attach to any C-mount camera.
- Short tube length (approx. 4 inches) and small diameter (1.25 inches).
- Fixed and/or 3 mm fine focus models available.
- High transmission (>70%) over the visible to near IR spectrum.
- Covers magnification factors between 0.22X and 91X.
- Working distance ranges from 13 mm to 370 mm.

ryf ag
Ryf AG
Bettlachstrasse 2
2540 Grenchen
tel 032 654 21 00
fax 032 654 21 09
www.ryfag.ch

NAVITAR

Precise Eye

Not Your Standard Video Lens

There are a growing number of video imaging applications in which a single, constant magnification and a fixed working distance are required. Navitar has responded to this need with our Precise Eye series of lenses.

Precise Eye lenses are designed to provide superior optical performance and high vibration stability over standard C-mount video lenses. They are optically precise and rugged to meet the demanding needs of fixed, high magnification machine vision, metrology, biomedical, fiber optic, and electronic imaging applications.

Precise Eye lenses incorporate Navitar's precision engineering and quality construction, resulting in images that are sharp, high resolution and optically corrected for remarkable image quality.

Precision

Precise Eye lenses provide high resolution and low distortion. The resolution capability (the ability to distinguish minute detail) exceeds that of standard C-mount video lenses and most other competitive micro optics. Precise Eye lenses from Navitar yield image resolution as high as 220 lp/mm.

Contrast

The lenses in the Precise Eye series not only resolve finer details, but provide higher contrast levels (the difference between light and dark features) over standard video optics. A lens that produces an image with high contrast will increase the performance of an image processing system.

Transmission

Precise Eye lenses are supplied with a high quality, broad band, high efficiency, anti-reflection coating that is optically corrected for the spectral range of 400nm – 1000nm which allows each lens to image light from NIR laser diode and NdYAG lasers.

Working Distance

Precise Eye lenses offer high magnification at long working distances in order to provide the necessary space required for equipment, specimen handling and lighting.

Flexible by Design

The Precise Eye series of lenses is designed on a modular basis. This interchangeable design, combined with a wide selection of available attachments, fixed or 3 mm fine focus, allows you to easily meet your exact needs.

Lighting

Fiber optic, LED, co-axial, ring light or other light sources can be selected for specific applications.

Distortion

Precise Eye lenses can attain distortion of less than 0.14%.

Selecting the Correct Lens

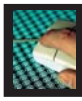
Simply choose the block from the Magnification Matrix that most closely approximates your requirements.

Precise Eye Versus Video Lenses

When selecting a lens for high precision applications, it is important to differentiate between standard video lenses and Navitar's Precise Eye series. Video lenses were originally designed for very low magnification, surveillance applications at working distances of greater than three feet (approximately 1 meter). They were never intended for the high vibration and high magnification environments of the factory floor. The usage of extension tubes and close-up diopter lenses enable a standard Video lens to work close-up, but this increases distortion and produces loss of resolution.

On the other hand, the Precise Eye series is designed to provide high resolution, diffraction-limited performance for high magnification fixed applications. The Navitar Precise Eye series covers magnification factors between 0.22X and 91.0X. The working distance ranges from 13 mm up to 370 mm.

Precise and robust, they are used in machine vision and biomedical applications requiring a fixed field of view, high magnification and high quality image from a long working distance. They provide a fixed aperture, fixed focus and fixed working distance which ensures robust and repeatable performance in your demanding environment. Fine focus mechanisms are available on two models.



Precise Eye system dimensions can be found on our website at www.machinevision.navitar.com

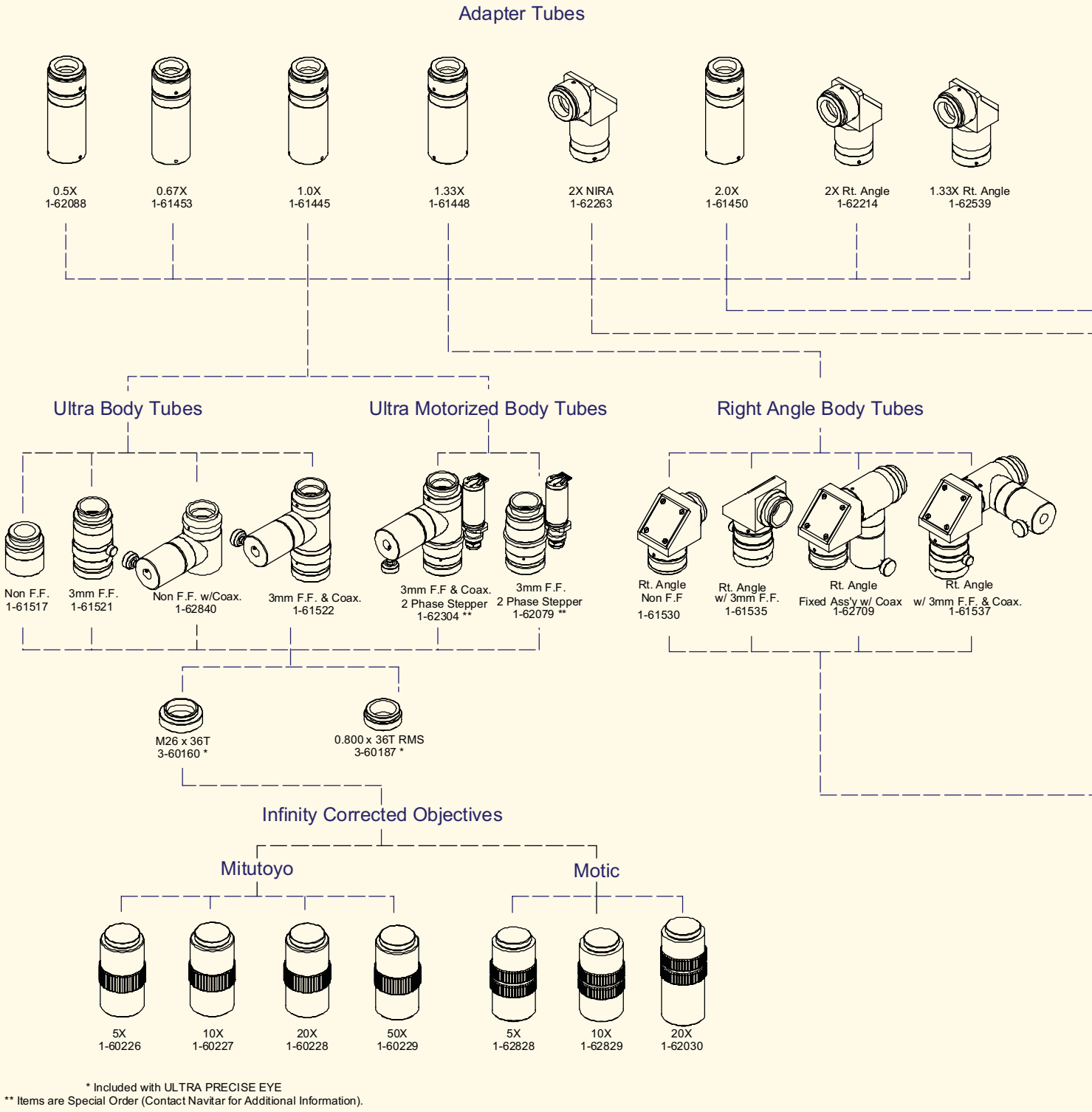
Precise Eye

Precise Eye Field of View Matrix (in mm at nominal working distance)

Lens Attachment	W.D. (mm)	Camera Format & Parameters	0.5X Adapter 1-62088	0.67X Adapter 1-61453	1.0X Adapter 1-61445	1.33X Adapter 1-61448	2.0X Adapter 1-61450
0.25X 0.018 N.A. DOF 1.59 mm 1-6044	356 (nominal)	Mag.	0.22X	0.30X	0.45X	0.60X	0.90X
		Field 1/4”	14.2(h) 10.6(v)	10.7(h) 8.0(v)	7.1(h) 5.3(v)	5.3(h) 4.0(v)	3.6(h) 2.7(v)
		Field 1/3”	21.4(h) 16.0(v)	15.9(h) 11.9(v)	10.7(h) 8.0(v)	8.0(h) 6.0(v)	5.3(h) 4.0(v)
	300-370 (1) W.D. Range	Field 1/2”	28.4(h) 21.4(v)	21.2(h) 15.9(v)	14.2(h) 10.7(v)	10.6(h) 8.0(v)	7.1(h) 5.3(v)
		Field 2/3”	39.2(h) 29.4(v)	—	19.6(h) 14.7(v)	14.7(h) 11.0(v)	—
0.5X 0.035 N.A. DOF 0.40 mm 1-60110	175 (nominal)	Mag.	0.45X	0.60X	0.90X	1.2X	1.8X
		Field 1/4”	7.2(h) 5.2(v)	5.3(h) 4.0(v)	3.6(h) 2.6(v)	2.7(h) 2.0(v)	1.8(h) 1.3(v)
		Field 1/3”	10.6(h) 8.0(v)	8.0(h) 6.0(v)	5.3(h) 4.0(v)	4.0(h) 3.0(v)	2.7(h) 2.0(v)
	170-190 (1) W.D. Range	Field 1/2”	14.2(h) 10.6(v)	10.6(h) 8.0(v)	7.1(h) 5.3(v)	5.3(h) 4.0(v)	3.6(h) 2.7(v)
		Field 2/3”	19.6(h) 14.6(v)	—	9.8(h) 7.3(v)	7.3(h) 5.5(v)	—
0.75X 0.054 N.A. DOF 0.18 mm 1-60111	113 (nominal)	Mag.	0.7X	0.90X	1.4X	1.8X	2.7X
		Field 1/4”	4.6(h) 3.6(v)	3.6(h) 2.7(v)	2.3(h) 1.8(v)	1.8(h) 1.3(v)	1.2(h) 0.9(v)
		Field 1/3”	7.2(h) 5.4(v)	5.3(h) 4.0(v)	3.6(h) 2.7(v)	2.7(h) 2.0(v)	1.8(h) 1.3(v)
	110-120 (1) W.D. Range	Field 1/2”	9.4(h) 7.2(v)	7.1(h) 5.3(v)	4.7(h) 3.6(v)	3.6(h) 2.7(v)	2.4(h) 1.8(v)
		Field 2/3”	13.0(h) 9.8(v)	—	6.5(h) 4.9(v)	4.9(h) 3.7(v)	—
None 0.070 N.A. DOF 0.10 mm	92 (nominal)	Mag.	0.9X	1.2X	1.8X	2.4X	3.6X
		Field 1/4”	3.6(h) 2.6(v)	2.7(h) 2.0(v)	1.8(h) 1.3(v)	1.3(h) 1.0(v)	0.9(h) 0.7(v)
		Field 1/3”	5.4(h) 4.0(v)	4.0(h) 3.0(v)	2.7(h) 2.0(v)	2.0(h) 1.5(v)	1.3(h) 1.0(v)
	90-93 (1) W.D. Range	Field 1/2”	7.2(h) 5.4(v)	5.3(h) 4.0(v)	3.6(h) 2.7(v)	2.7(h) 2.0(v)	1.8(h) 1.3(v)
		Field 2/3”	9.8(h) 7.4(v)	—	4.9(h) 3.7(v)	3.7(h) 2.8(v)	—
1.5X 0.104 N.A. DOF 0.04 mm 1-60112	51 (nominal)	Mag.	1.35X	1.8X	2.7X	3.6X	5.4X
		Field 1/4”	2.4(h) 1.8(v)	1.8(h) 1.3(v)	1.2(h) 0.9(v)	0.9(h) 0.7(v)	0.6(h) 0.4(v)
		Field 1/3”	3.6(h) 2.6(v)	2.7(h) 2.0(v)	1.8(h) 1.3(v)	1.3(h) 1.0(v)	0.9(h) 0.7(v)
	49-51 (1) W.D. Range	Field 1/2”	4.8(h) 3.6(v)	3.6(h) 2.7(v)	2.4(h) 1.8(v)	1.8(h) 1.3(v)	1.2(h) 0.9(v)
		Field 2/3”	6.6(h) 4.8(v)	—	3.3(h) 2.4(v)	2.4(h) 1.8(v)	—
2.0X 0.141 N.A. DOF 0.02 mm 1-60113	36 (nominal)	Mag.	1.8X	2.4X	3.6X	4.8X	7.2X
		Field 1/4”	1.8(h) 1.4(v)	1.3(h) 1.0(v)	0.9(h) 0.7(v)	0.7(h) 0.5(v)	0.5(h) 0.3(v)
		Field 1/3”	2.6(h) 2.0(v)	2.0(h) 1.5(v)	1.3(h) 1.0(v)	1.0(h) 0.8(v)	0.7(h) 0.5(v)
	35-36 (1) W.D. Range	Field 1/2”	3.6(h) 2.6(v)	2.7(h) 2.0(v)	1.8(h) 1.3(v)	1.3(h) 1.0(v)	0.9(h) 0.7(v)
		Field 2/3”	4.8(h) 3.6(v)	—	2.4(h) 1.8(v)	1.8(h) 1.4(v)	—

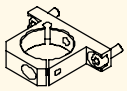
(1) Working distance range when using 3 mm fine focus. Field of view will change with shorter or longer working distances.

Precise Eye System Diagram

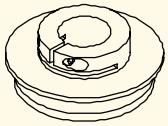


* Included with ULTRA PRECISE EYE
** Items are Special Order (Contact Navitar for Additional Information).

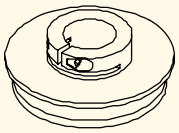
Adapter Plates



Mounting Clamp
1-61510



(76mm)
1-61662



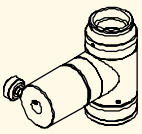
(84mm)
1-61663

Standard Body Tubes

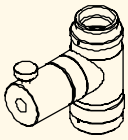
Non F.F.
1-61456

3mm F.F.
w/ Aperture
1-62473

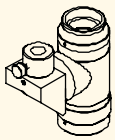
3mm F.F.
1-61449



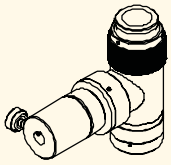
Non F.F.
w/ Coax
1-62707



3mm F.F.
w/ Coax.
1-61446

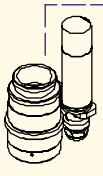


3mm F.F.
w/ Rt. Ang. Coax
1-62247

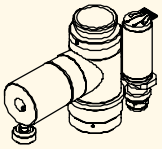


Polarizer/Analyzer
w/ 3mm F.F.
1-61817

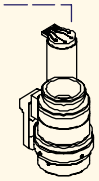
Motorized Body Tubes



3mm F.F.
Encoded/Servo
1-62691 **



3mm F.F. w/ coax
2 Phase Stepper
1-62302 **



3mm F.F.
2 PhaseStepper
w/ HE Limits
1-62693**

Lens Attachments

0.25X
1-6044

0.5X
1-60110

0.75X
1-60111

1.5X
1-60112

2X
1-60113

Rev. 031708

Key Terms for Understanding the Matrix Charts

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

Magnification
A measure of the apparent difference 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.

N.A. Image Side
Measurement at the image point of the largest cone of light rays that are entering the optical system.

N.A. Object Side
Measurement at the object point of the largest cone of light rays that are entering the optical system.

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.

Precise Eye Performance Specifications

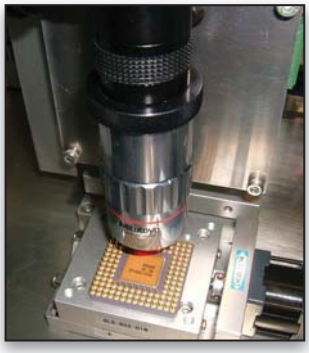
Precise Eye Combinations Lens Attachment + Precise Eye + Rear Adapter	W.D.	Magnification	N.A. Object Side	Resolve Limits (microns)	Depth of Field (mm)	Required Matching Pixel Size (microns)
0.25x + Precise Eye + 0.5x	356	0.23x	0.018	9.4	1.59	2.1
0.25x + Precise Eye + 0.67x	356	0.30x	0.018	9.4	1.59	2.8
0.25x + Precise Eye + 1.0x	356	0.45x	0.018	9.4	1.59	4.2
0.25x + Precise Eye + 1.33x	356	0.60x	0.018	9.4	1.59	5.6
0.25x + Precise Eye + 2.0x	356	0.90x	0.018	9.4	1.59	8.4
0.5x + Precise Eye + 0.5x	175	0.45x	0.035	4.7	0.40	2.1
0.5x + Precise Eye + 0.67x	175	0.60x	0.035	4.7	0.40	2.8
0.5x + Precise Eye + 1.0x	175	0.90x	0.035	4.7	0.40	4.2
0.5x + Precise Eye + 1.33x	175	1.20x	0.035	4.7	0.40	5.6
0.5x + Precise Eye + 2.0x	175	1.80x	0.035	4.7	0.40	8.4
0.75x + Precise Eye + 0.5x	113	0.68x	0.054	3.1	0.18	2.1
0.75x + Precise Eye + 0.67x	113	0.90x	0.054	3.1	0.18	2.8
0.75x + Precise Eye + 1.0x	113	1.35x	0.054	3.1	0.18	4.2
0.75x + Precise Eye + 1.33x	113	1.80x	0.054	3.1	0.18	5.6
0.75x + Precise Eye + 2.0x	113	2.70x	0.054	3.1	0.18	8.4
1.0x + Precise Eye + 0.5x	92	0.90x	0.071	2.3	0.10	2.1
1.0x + Precise Eye + 0.67x	92	1.21x	0.071	2.3	0.10	2.8
1.0x + Precise Eye + 1.0x	92	1.80x	0.071	2.3	0.10	4.2
1.0x + Precise Eye + 1.33x	92	2.39x	0.071	2.3	0.10	5.6
1.0x + Precise Eye + 2.0x	92	3.60x	0.071	2.3	0.10	8.4
1.5x + Precise Eye + 0.5x	51	1.35x	0.104	1.6	0.04	2.1
1.5x + Precise Eye + 0.67x	51	1.81x	0.104	1.6	0.04	3.0
1.5x + Precise Eye + 1.0x	51	2.70x	0.104	1.6	0.04	4.4
1.5x + Precise Eye + 1.33x	51	3.59x	0.104	1.6	0.04	5.8
1.5x + Precise Eye + 2.0x	51	5.40x	0.104	1.6	0.04	8.6
2.0x + Precise Eye + 0.5X	36	1.80x	0.141	1.2	0.02	2.1
2.0x + Precise Eye + 0.67x	36	2.41x	0.141	1.2	0.02	2.8
2.0x + Precise Eye + 1.0x	36	3.60x	0.141	1.2	0.02	4.2
2.0x + Precise Eye + 1.33x	36	4.79x	0.141	1.2	0.02	5.6
2.0x + Precise Eye + 2.0x	36	7.20x	0.141	1.2	0.02	8.4

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."*

Ultra Precise Eye

Navitar also offers a variety of Ultra Precise Eye systems ideal for high magnification applications. The advanced design produces outstanding contrast and precision, while providing higher resolution and magnification than the standard Precise Eye. These systems incorporate infinity corrected objectives to provide long working distances and excellent edge flatness and clarity. The Ultra Precise Eye is also available with fine focus (1-61521) or with fine focus and co-axial illumination (1-61522).



Navitar Ultra Precise Eye inspecting PCB components.

Ultra Precise Eye Magnification Matrix (in mm)

Infinity Corrected Objective (Mitutoyo)	W.D. (mm)	Camera Format & Parameters	0.5X Adapter 1-62088	0.67X Adapter 1-61453	1.0X Adapter 1-61445	1.33X Adapter 1-61448	2.0X Adapter 1-61450
5X 0.14 N.A. 1-60226	34	Mag.	2.27X	3.05X	4.55X	6.10X	9.10X
		Field 1/4”	1.4(h) 1.06(v)	1.05(h) 0.79(v)	0.70(h) 0.53(v)	0.52(h) 0.39(v)	0.35(h) 0.26(v)
		Field 1/3”	2.12(h) 1.58(v)	1.57(h) 1.18(v)	1.06(h) 0.79(v)	0.79(h) 0.59(v)	0.53(h) 0.40(v)
		Field 1/2”	2.82(h) 2.12(v)	2.10(h) 1.58(v)	1.41(h) 1.06(v)	1.05(h) 0.79(v)	0.70(h) 0.53(v)
		Field 2/3”	—	—	1.93(h) 1.46(v)	1.44(h) 1.08(v)	—
10X 0.28 N.A. 1-60227	33	Mag.	4.55X	6.1X	9.10X	12.2X	18.2X
		Field 1/4”	0.70(h) 0.52(v)	0.52(h) 0.39(v)	0.35(h) 0.26(v)	0.26(h) 0.20(v)	0.18(h) 0.13(v)
		Field 1/3”	1.06(h) 0.80(v)	0.79(h) 0.59(v)	0.53(h) 0.40(v)	0.39(h) 0.30(v)	0.26(h) 0.20(v)
		Field 1/2”	1.40(h) 1.06(v)	1.05(h) 0.79(v)	0.70(h) 0.53(v)	0.52(h) 0.39(v)	0.35(h) 0.26(v)
		Field 2/3”	—	—	0.97(h) 0.73(v	0.72(h) 0.54(v)	—
20X 0.42 N.A. 1-60228	20	Mag.	9.1X	12.2X	18.2X	24.4X	36.4X
		Field 1/4”	0.36(h) 0.26(v)	0.26(h) 0.20(v)	0.18(h) 0.13(v)	0.13(h) 0.10(v)	0.09(h) 0.07(v)
		Field 1/3”	0.52(h) 0.40(v)	0.39(h) 0.30(v)	0.26(h) 0.20(v)	0.20(h) 0.15(v)	0.13(h) 0.10(v)
		Field 1/2”	0.70(h) 0.52(v)	0.52(h) 0.39(v)	0.35(h) 0.26(v)	0.26(h) 0.20(v)	0.18(h) 0.14(v)
		Field 2/3”	—	—	0.48(h) 0.36(v)	0.36(h) 0.27(v)	—
50X 0.55 N.A. 1-60229	13	Mag.	22.75X	30.5X	45.5X	61.0X	91.0X
		Field 1/4”	0.14(h) 0.10(v)	0.10(h) 0.08(v)	0.07(h) 0.05(v)	0.05(h) 0.04(v)	0.04(h) 0.03(v)
		Field 1/3”	0.22(h) 0.16(v)	0.16(h) 0.12(v)	0.11(h) 0.08(v)	0.08(h) 0.06(v)	0.06(h) 0.04(v)
		Field 1/2”	0.28(h) 0.22(v)	0.21(h) 0.16(v)	0.14(h) 0.11(v)	0.11(h) 0.08(v)	0.07(h) 0.05(v)
		Field 2/3”	—	—	0.19(h) 0.15(v)	0.14(h) 0.11(v)	—

NOTE: The O-I remains constant for each body tube (main assembly) regardless of which infinity corrected objective and adapter are selected: 1-61517 I-O = 219 mm, 1-61521 I-O = 243 mm, 1-61522 I-O = 263 mm

Ultra Precise Eye system dimensions can be found on our website at www.machinevision.navitar.com

Precise Eye Internal Co-axial

Navitar's Precise Eye with Internal Co-axial Illumination (1-61446) is an ideal solution for applications involving highly reflective surfaces, such as wafers, polished samples, and fluids. Designed to provide even illumination for higher magnification applications, coaxial illumination provides extremely detailed resolution, particularly when a high resolutin camera is used.

Precise Eye Field of View Matrix for Internal Co-axial (in mm at nominal working distance)

Lens Attachment	W.D. (mm)	Camera Format & Parameters	0.5X Adapter 1-62088	0.67X Adapter 1-61453	1.0X Adapter 1-61445	1.33X Adapter 1-61448	2.0X Adapter 1-61450
0.5X 0.035 N.A. DOF 0.40 mm 1-60110	175 (nominal) 170-190 (1) W.D. Range	Mag.	0.45X	0.60X	0.90X	1.2X	1.8X
		Field 1/4"	7.2(h) 5.2(v)	5.3(h) 4.0(v)	3.6(h) 2.6(v)	2.7(h) 2.0(v)	1.8(h) 1.3(v)
		Field 1/3"	—	8.0(h) 6.0(v)	5.3(h) 4.0(v)	4.0(h) 3.0(v)	2.7(h) 2.0(v)
		Field 1/2"	—	—	7.1(h) 5.3(v)	5.3(h) 4.0(v)	3.6(h) 2.7(v)
		Field 2/3"	—	—	—	7.3(h) 5.5(v)	—
0.75X 0.054 N.A. DOF 0.17 mm 1-60111	113 (nominal) 110-120 (1) W.D. Range	Mag.	0.7X	0.90X	1.4X	1.8X	2.7X
		Field 1/4"	4.6(h) 3.6(v)	3.6(h) 2.7(v)	2.3(h) 1.8(v)	1.8(h) 1.3(v)	1.2(h) 0.9(v)
		Field 1/3"	7.2(h) 5.4(v)	5.3(h) 4.0(v)	3.6(h) 2.7(v)	2.7(h) 2.0(v)	1.8(h) 1.3(v)
		Field 1/2"	—	7.1(h) 5.3(v)	4.7(h) 3.6(v)	3.6(h) 2.7(v)	2.4(h) 1.8(v)
		Field 2/3"	—	—	6.5(h) 4.9(v)	4.9(h) 3.7(v)	—
None 0.070 N.A. DOF 0.10 mm	92 (nominal) 90-93 (1) W.D. Range	Mag.	0.9X	1.2X	1.8X	2.4X	3.6X
		Field 1/4"	3.6(h) 2.6(v)	2.7(h) 2.0(v)	1.8(h) 1.3(v)	1.3(h) 1.0(v)	0.9(h) 0.7(v)
		Field 1/3"	5.4(h) 4.0(v)	4.0(h) 3.0(v)	2.7(h) 2.0(v)	2.0(h) 1.5(v)	1.3(h) 1.0(v)
		Field 1/2"	7.2(h) 5.4(v)	5.3(h) 4.0(v)	3.6(h) 2.7(v)	2.7(h) 2.0(v)	1.8(h) 1.3(v)
		Field 2/3"	—	—	4.9(h) 3.7(v)	3.7(h) 2.8(v)	—
1.5X 0.104 N.A. DOF 0.046 mm 1-60112	51 (nominal) 49-51 (1) W.D. Range	Mag.	1.35X	1.8X	2.7X	3.6X	5.4X
		Field 1/4"	2.4(h) 1.8(v)	1.8(h) 1.3(v)	1.2(h) 0.9(v)	0.9(h) 0.7(v)	0.6(h) 0.4(v)
		Field 1/3"	3.6(h) 2.6(v)	2.7(h) 2.0(v)	1.8(h) 1.3(v)	1.3(h) 1.0(v)	0.9(h) 0.7(v)
		Field 1/2"	4.8(h) 3.6(v)	3.6(h) 2.7(v)	2.4(h) 1.8(v)	1.8(h) 1.3(v)	1.2(h) 0.9(v)
		Field 2/3"	6.6(h) 4.8(v)	—	3.3(h) 2.4(v)	2.4(h) 1.8(v)	—
2.0X 0.141 N.A. DOF 0.025 mm 1-60113	36 (nominal) 35-36 (1) W.D. Range	Mag.	1.8X	2.4X	3.6X	4.8X	7.2X
		Field 1/4"	1.8(h) 1.4(v)	1.3(h) 1.0(v)	0.9(h) 0.7(v)	0.7(h) 0.5(v)	0.5(h) 0.3(v)
		Field 1/3"	2.6(h) 2.0(v)	2.0(h) 1.5(v)	1.3(h) 1.0(v)	1.0(h) 0.8(v)	0.7(h) 0.5(v)
		Field 1/2"	3.6(h) 2.6(v)	2.7(h) 2.0(v)	1.8(h) 1.3(v)	1.3(h) 1.0(v)	0.9(h) 0.7(v)
		Field 2/3"	4.8(h) 3.6(v)	—	2.4(h) 1.8(v)	1.8(h) 1.4(v)	—

Notes:
The internal coax will illuminate a circular area of about 11 mm in diameter. Any field of view larger than 11 mm will have darkened corners.
(1) Working distance range when using 3 mm fine focus. Field of view will change with shorter or longer working distance.

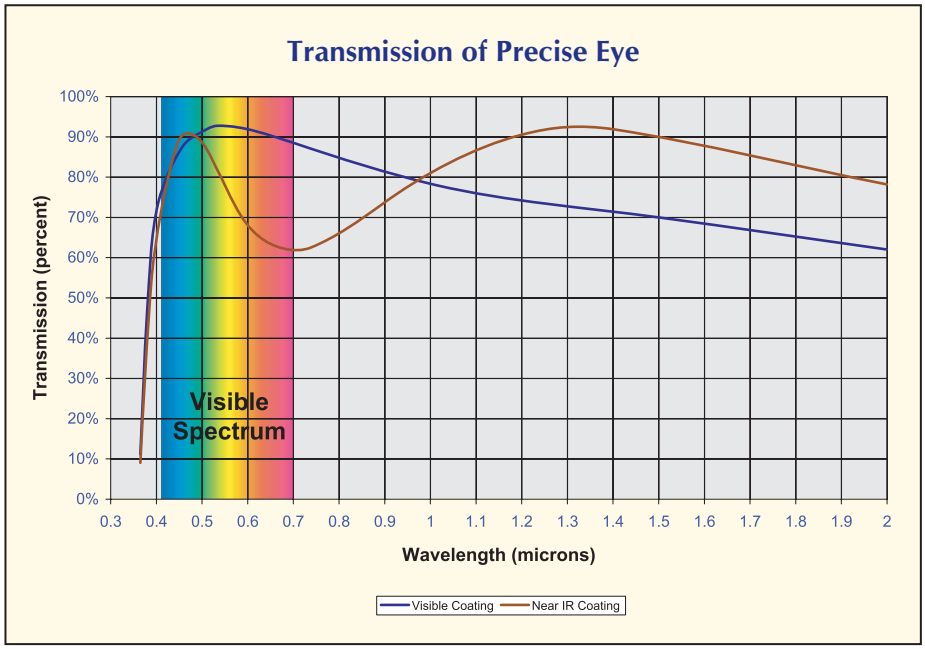
Precise Eye NIR Lens

Navitar's Precise Eye NIR lens system offers high resolution and unparalleled sensitivity for capturing microscopic images. We have specially coated the glass on our Precise Eye NIR lens systems to be optimized for imaging in the 700-1550nm (0.7-1.5 microns) wavelength range. Our Precise Eye NIR lens system is easy to configure and set up. Simply find the field of view and working distance required just as you would with any of our other standard Precise Eye lenses.

For a complete listing of available Precise Eye NIR parts, please reference our website or contact your Navitar sales representative.

About Using NIR Lenses

The wavelength band just beyond the visible is known as Near Infrared (NIR). NIR is the electromagnetic band of wavelengths between 0.7-1.5 microns (700-1550nm). When light strikes a glass surface, a portion is bounced back, thereby reducing the strength of the transmitted image. Apply this behavior to fixed focal length optics with many glass surfaces, and the result is a severe reduction in image intensity. To counteract the loss, the lenses are coated with materials that minimize this effect.

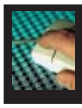


Applications Where NIR Optics are Useful

- Wafer characterization.
- Laser beam profiling.
- Optical component measurement and analysis.
- Fiber alignment and inspection.
- Assembly and monitoring.

Note: Since NIR lenses are not operating within the visible spectrum, the resulting image is slightly different than when using a standard Precise Eye system. The standard lens resolution limits of an NIR lens are based on an assumed average wavelength of 0.5 microns and is inversely proportional to wavelength (maximum MTF = 3000xNA in the visible wavelength). Therefore, substituting a wavelength of 1.5 microns will reduce the maximum resolution by a factor of 3. In practice, this means a slight reduction of contrast at the higher wavelengths.

Lens focal lengths shift slightly with wavelength, which impacts the Numerical Aperture (NA), which affects the depth of field (.0005/NA^2). Generally, the NA is reduced, which produces a greater depth of field, along with a reduction in maximum resolution. Standard NIR microscope objectives are usually lower in NA, also reducing maximum resolution values.

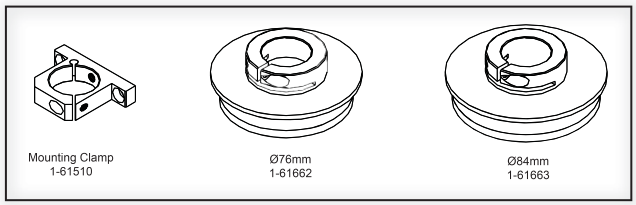


A list of all Precise Eye NIR lens system components can be found on our website at www.machinevision.navitar.com

Precise Eye Accessories

Precise Eye Stand Adapters and Clamps

Navitar offers different stand adapter plates so you can use your Precise Eye system with various focus mounts, including Nikon, Olympus and Meiji. A mounting clamp is also available for applications where the Precise Eye needs to be mounted within existing equipment.



Lighting Accessories

- LED ring lights
- Brightlight LED coaxial illuminators
- Fiber optics illuminators
- Power supplies

Illumination has proven to be one of the most important components when designing a successful imaging system. Navitar thoroughly understands that the correct lighting can only enhance the performance of our industry leading vision systems.

Our LED-based ring lights and coaxial lights were designed with careful consideration for the standard working distances that most of our customers use. The components are low profile and provide bright, even illumination to compliment the performance of your vision system.

Our series of high intensity fiber optic illuminators and accessories allow you to position your light for the best possible viewing. These versatile illuminators offer low operating temperatures and low noise output.

Digital Camera Adapter

Navitar's unique Digital Camera Adapter allows you to couple your digital camera or camcorder to any C-mount or standard SLR lens, microscope or telescope, permitting a digital recording of your subject matter.

The Digital Camera Adapter comes with a male M37 x 0.75 thread, a popular thread size used on a number of different cameras. If, however, your camera does not have the correct thread size, the required adapter is readily available from most aftermarket camera shops (recommended web sites are www.dcprodirect.com or www.steves-digicams.com).

- Attaches digital camera or camcorder to any C-mount or standard SLR lens.
- Permits digital recording of subject matter.
- Includes a male M37 x 0.75 thread.
- Fits any standard 30 mm microscope eyepiece port.
- Enables any lens to be used as a standard monocular for direct viewing with the eye.

The Navitar Camera Adapter works beautifully with microscopes, fitting into any standard 30 mm eyepiece port. In the case of SLR lenses, the appropriate C-mount adapter will be needed (i.e. Pentax K-mount to C-mount adapter, T-mount to C-mount adapter, etc.). Telescopes require a 1¼" to C-mount adapter. All of these various adapters can be fitted to the Navitar Digital Camera Adapter to couple cameras and camcorders to virtually any lens, microscope or telescope.

In addition to allowing you to photograph and record digital images, this innovative camera adapter also enables any lens to be used as a standard monocular for direct viewing with the eye.