Lenses & Microscope Components

Lenses

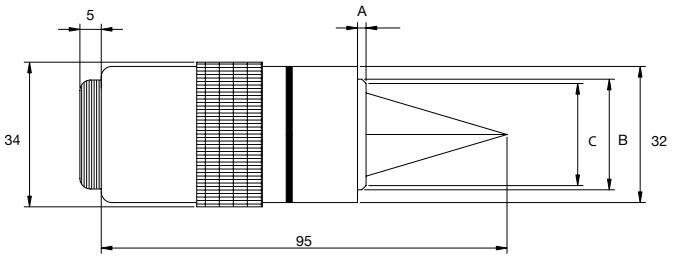
Microscope Components

M Plan Apochromat Infiniti-Corrected Objectives

Standard Objectives

- ***Long Working Distances***
- ***High Quality Apochromat Design***
- ***Flat Image Surface Over Entire FOV***
- ***Common 95mm Parfocal Distance Super-Long (SL) Objectives***
- ***Super-Long Working Distance for Bright Field Inspection***
- ***100X with 13mm Working Distance***
- ***Flat Image Surface Over Entire FOV***
- ***Excellent Color Reproducibility NIR Objectives***
- ***Long Working Distance for Bright Field Inspection***
- ***Superior Performance at 1064nm***
- ***Ideal for use in Laser Marking and Cutting Semiconductor Circuits***
- ***Broadband Spectral Range***

All the M Plan APO objectives provide a combined optimum working distance and optical performance. In addition, the objectives have a 95mm Parfocal length and are optimized for bright field illumination. The NIR objectives combine the benefits of the standard and SL Objectives along with an enhanced spectral range up to 1650nm.



Measurements (mm)

	2X	5X	10X	20X	50X	SL50X	SL100X
A	2.0	1.1	1.5	2.0	1.2	1.0	1.5
B	27.5	27.5	27.5	26	26	26	26
C	25	20	23	24	23	24.5	21.5

Mounting Thread: 26mm x 0.706mm Pitch (36 TPI)
Optical coatings are optimized between 450 and 650nm with no more than 0.5% transmission variation. There may be some noticeable color differences from one objective lot to another. These differences are expected and have little or no effect on the products' performance.

M Plan Apochromat Infiniti-Corrected Objectives

Catalog Number	Mag.	N.A.	WD (mm)	FL (mm)	Res. (um)	DFD (um)	Mfg. Tol. (um)	Transmission Range	Price US
24-8200	2X	0.06	34	100	5	+/- 91	+/- 50	450 – 650 nm	$759.00
24-8205	5X	0.14	34	40	2	+/- 14	+/- 20	450 – 650 nm	$569.00
24-8210	10X	0.28	33.5	20	1.0	+/- 3.5	+/- 10	450 – 650 nm	$715.00
24-8215	20X	0.42	20	10	0.7	+/- 1.6	+/- 10	450 – 650 nm	$1,669.00
24-8220	50X	0.06	13	4	0.5	+/- 0.9	+/- 5	450 – 650 nm	$2,189.00
24-8225	SL50X	0.42	22.5	4	0.7	+/- 1.6	+/- 10	450 – 650 nm	$2,759.00
24-8230	SL100X	0.55	13	2	0.5	+/- 0.9	+/- 5	450 – 650 nm	$3,899.00
24-8235	NIR5X	0.14	34	40	2	+/- 14	+/- 20	450 – 1650 nm	$1,299.00
24-8240	NIR20X	0.42	21	10	0.7	+/- 1.6	+/- 10	450 – 1650 nm	$2,679.00
24-8245	NIR50X	0.42	19.5	4	0.7	+/- 1.6	+/- 10	450 – 1650 nm	$3,189.00
24-8250	NIR100X	0.55	13	2	0.5	+/- 0.9	+/- 5	450 – 1650 nm	$4,359.00

Laboratory Microscope Objectives

- ***Ideal for visible microscopy***
- ***Works with most major brand microscopes***

These microscope objectives will work with all major brands of microscopes designed for a 160 mm-tube length. They are intended for general laboratory use in the visible spectrum. All optical surfaces are AR coated for maximum throughput.

Laboratory Microscope Objectives

Catalog Number	Magnification	NA	Focal Length, f (mm)	Working Distance (mm)	Price US
24-7429	X5	0.12	25.50	16.00	$55.00
24-7437	X10	0.25	15.60	6.80	$63.00
24-7445	X20	0.40	8.55	3.32	$105.00
24-7452	X40	0.65	4.50	0.45	$116.00
24-7460	X60	0.85	2.90	0.18	$145.00

Reflecting Objectives

- ***Ideal for laser beam delivery***
- ***Freedom from chromatic aberration***
- ***Long working distances with high magnifications***
- ***Large numerical aperture***

Ealing Reflecting Microscope Objectives are known for their unique optical properties. Because of their all-reflecting construction, they are free from chromatic aberration. The system consists of a small convex primary mirror and a larger concave secondary mirror. By choosing appropriate values for the mirror radii of curvature and their separation, it is possible to correct three of the primary monochromatic aberrations for the system. The aberrations that are corrected are the primary spherical aberration, primary coma and primary astigmatism.

In addition to their correction for monochromatic aberrations, Reflecting Microscope Objectives have many advantages over refracting objectives of equivalent aperture and focal length.

For laser delivery applications, one should be aware of the effect of the central obscuration on the total energy throughput, especially with beams of a non-uniform irradiance profile (e.g. Gaussian beams). The percentage obscuration is listed for each of the objectives as part of their specification. The possible loss of energy here should be weighed against the benefits of tighter energy concentration and mirror coatings specific to the radiation being used. Improved throughput may require expansion of the beam diameter to match the diameter of the input mirror.

General Notes

Relative centration of the two mirrors in the Ealing Reflecting Objectives is precisely adjusted before leaving the factory and, in normal use, should not require any further adjustment. Objectives should, however, be checked periodically for centration. Detailed instructions for centration are given in the handbook supplied with each Reflecting Objective.

Because of their high numerical aperture, three of the models incorporate a user adjustment for variations in cover glass thickness and tube length, which may occur in routine microscopy work.

Note that for objectives of higher numerical aperture, serious chromatic aberration can result if the cover glass thickness exceeds 0.25 mm. Work with thicker cover glasses should be carried out in light of a narrow bandwidth.

For those objectives with user adjustment of mirror separation to permit compensation for variations in tube length and cover glass thickness, the centration should be checked following any change in separation.

Applications:

Beam Delivery Systems

Ealing Reflecting Microscope Objectives are being used in applications other than conventional microscopy. Their unique properties where dual wavelength operation is required give them an expanding range of applications, including:

- FT-IR Spectroscopy & Microscopy
- Photolithography
- Thin Film Measurement
- Semiconductor Annealing
- Laser Drilling and Etching
- Product Marking
- Microsurgery
- Laser Pumping

Conventional Microscopy

Ealing Reflecting Microscope Objectives may be used interchangeably with conventional refracting objectives. However, they are considerably larger in both length and diameter than a conven-tional refracting objective. In addition the obscuration modifies the Airy disc pattern by making the central spot smaller, and the outer rings slightly brighter.

Six models of Reflecting Objective are available as standard. These are as tabulated in the specification chart and displayed in the diagrams.

Each standard reflecting objective is supplied with internal mirrors coated with bare aluminum. This combination is useful in most applications involving low power levels. Each standard reflecting objective is offered in three standard coating options: bare aluminum, UV-enhanced aluminum, and graded gold. The bare aluminum coating is useful for most applications. The UV-enhanced aluminum exhibits good reflectivity (>89%) down to 190 nm and is highly recommended for most UV use. Ealing also offers a gold coating that is ideal for IR applications. Please add the appropriate coating suffix to indicate the desired type of coating.

Specifications

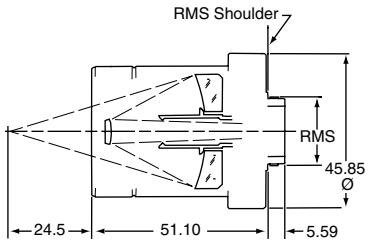
	Catalog Number					
	25-0506	25-0555	25-0514	25-0522	25-0548	25-0563
Magnification	X15	X15	X25	X36	X52	X74
NA	0.28	0.5	0.4	0.5	0.65	0.65
Focal Length (mm)	13.35	13.41	8.0	5.41	3.55	2.54
Visual FOV (mm)	1.2	1.2	0.72	0.5	0.34	0.24
Obscuration (%)	18.9	19.5	16.7	12.2	16.7	13.3
Working Distance (mm)	24.5	23.2	14.5	8.6	1.9	1.0
Small Mirror Diameter (mm)	7.3	13.4	6.3	5.6	4.6	3.35
User Adjustment for Tube Length and Cover Glass	No	No	No	Yes	Yes	Yes
Range of Cover Glass Thickness (mm)	0-3	0-3	0-3	0-1	0-1	0-1
Range of Tube Length (mm)	80 - ∞	80 - ∞	80 - ∞	90 - ∞	120 - ∞	120 - ∞

Reflecting Objectives

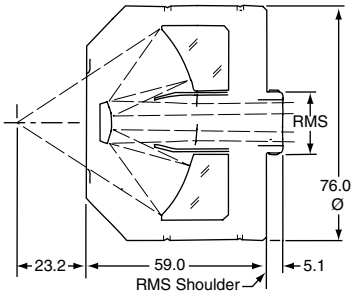
			Bare Aluminum -000	UV-Enhanced Aluminum -190	Gold -020
Magnigication	NA	Part	Price US	Price US	Price US
X15	0.28	25-0506	$1,999.00	$2,692.00	$2,461.00
X15	0.5	25-0555	$3,385.00	$4,078.00	$3,847.00
X25	0.4	25-0514	$2,033.00	$2,726.00	$2,495.00
X36	0.5	25-0522	$2,784.00	$3,477.00	$3,246.00
X52	0.65	25-0548	$2,957.00	$3,534.00	$3,419.00
X74	0.65	25-0563	$3,142.00	$3,835.00	$3,604.00

Coating Options

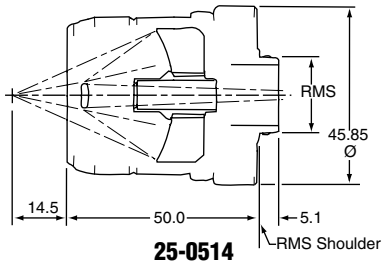
Coating Suffix	Coating Type	Wavelength	Average Reflectivity
-000	Bare Aluminum	>250 nm-10 µm	89%
-190	UV-Enhanced Aluminum	>190 nm-10 µm	89%
-020	Gold	>800 nm-10 µm	98%



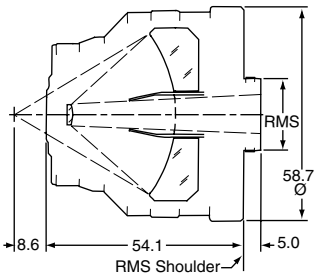
25-0506
X15 Reflecting Objective NA 0.28



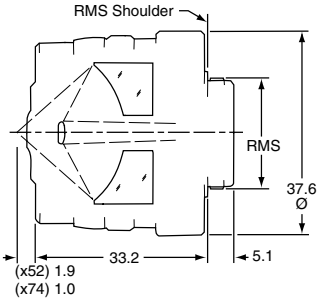
25-0555
X15 Reflecting Objective NA 0.5



25-0514
X25 Reflecting Objective NA 0.4



25-0522
X36 Reflecting Objective NA 0.5



25-0548 X52 and 25-0563 X74
Reflecting Objectives NA 0.65