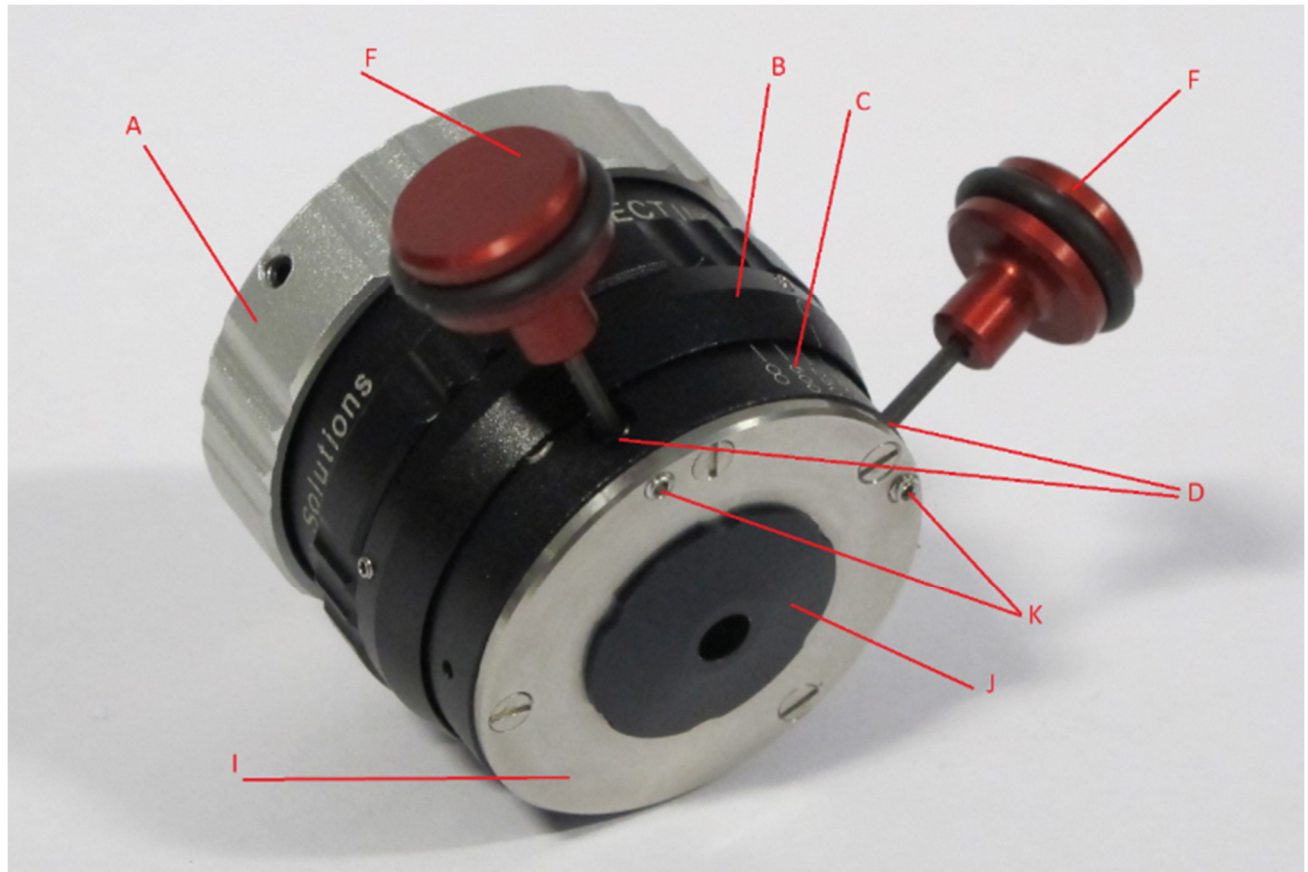


Reflecting Objectives

User Guide X25 NA0.40, X36 NA0.50, X52 NA0.65, X74 NA0.65

Introduction

Reflecting objectives from Beck Optronic Solutions build on C. R. Burch's 1947 demonstration that a precisely designed two-mirror system can eliminate spherical aberration, coma, and astigmatism. The theory also shows that adjusting the mirror separation allows the objective to maintain optimal performance across different tube lengths and cover-glass thicknesses. This compensation is available to the user in the X36, X52, and X74 objectives, but is preset to the customers requirements in the X25 objective.



On receiving your objective...

When you receive the objective, remove it from its box and inspect it carefully for any signs of transit damage. Confirm that the adjustment keys and the silverpoint slide are included.

Mounting the Objective

Beck Optronic Solutions reflecting objectives use a standard Royal Microscopical Society thread (0.8" x 36TPI Whitworth). Screw the objective firmly into the microscope or mounting plate.

The large scalloped mounting ring contains six small set screws (A). Loosening these slightly allows you to rotate the objective body to achieve the desired orientation—for example, positioning the spiders or, bringing the centering adjustment screws (B) into a more convenient location. Re-tighten the screws once the orientation is set.

About Beck Optronic Solutions

For more than 175 years, Beck has been synonymous with precision, innovation, and optical excellence. From our headquarters near London, UK, we engineer world-class electro-optic systems that empower defence and commercial partners to see further, respond faster, and operate with absolute confidence—across the full electromagnetic spectrum from UV to LWIR. **To explore solutions or request pricing, connect with our team at:**

t: +44 (0) 1442 255755 | e: info@beckoptronic.com | www.beckoptronic.com

Beck Optronic Solutions Limited | Registered in England No 09072729 | VAT No GB 196 4396 58
Registered office: Focus 31 – West Wing, Mark Road, Hemel Hempstead,
Hertfordshire HP2 7BW United Kingdom



Tube Length / Cover Slip Setting (except x25 NA 0.40)

The Burch design allows full compensation for tube-length and cover-slip changes through a small adjustment in mirror separation. Use the paired scales on the lower body—tube length (C) and cover-slip thickness (B)—and simply match the values. Settings assume standard borosilicate cover slips; contact BOS if your material differs. Always set these values before centering the secondary mirror.

Mirror Centering Adjustment

Precise centering of the secondary mirror is critical. The silverpoint slide provides a clear reference: correctly aligned pinholes form clean, circular Airy discs with continuous diffraction rings. Illuminate the slide in transmission, focus on small pinholes, and adjust the centering screws with the Allen keys until all coma is removed. Repeat after any tube-length or cover-slip change. A detailed guide is available at www.beckoptronic.com/support/

Further Notes

Centering Screws. Factory-tightened screws ensure stability; if adjustment feels stiff, slightly release the friction screws (K) with a 0.9 mm hex key, then re-tighten after alignment.

Front Working Distance The front stop (J) blocks stray light and preserves image contrast. It slightly reduces working distance but is strongly recommended. Remove only if a longer working distance is essential and illumination can be restricted to the field of view.

Centering the Optics Always center the objective at the tube-length and cover-slip values set on the scales. Changing these afterwards will disturb alignment. With no chromatic aberration, visible-light alignment remains valid across the full spectral range of your system.

Working Distance – Front

The front plate (I) includes a removable front stop (J) that blocks stray light and protects image contrast. Although it slightly reduces working distance, it prevents direct, unreflected light from reaching the image plane—avoiding flare and preserving fine detail. We strongly recommend using the front stop for optimal performance. It may be removed only when a longer working distance is essential and illumination can be confined strictly to the field of view.

Centering the Optics

When centering the system, always use the objective at the tube-length and cover-slip values set on the scales. These settings must not be changed afterward, as any adjustment will alter the secondary mirror's centration.

A key advantage of the reflecting objective is its complete freedom from chromatic aberration. This allows accurate alignment in the visible region even if you cannot observe the image at other wavelengths, ensuring correct setup before the objective is installed in your system.

Specifications

	5003 x 15 NA0.40	5004 X36 NA0.50	5006 X52 NA0.65	5007 X52 NA0.65
Focal Length	8.0 mm	5.4 mm	3.5 mm	2.6 mm
Magnification	X25	X36	X52	X74
Field of view at the object	0.72 mm diameter	0.50 mm diameter	0.34 mm diameter	0.24 mm diameter
Numerical aperture	0.40	0.50	0.65	0.65
% of central area obstructed	22.5%	13.0%	17.5%	15.0%
Working distance (approximate)	14.5 mm	8.6 mm	1.9 mm	1.0mm
Mounting thread	RMS, 0.8" 36 T.P.I., BSW			

References

The first paper to show that a high NA, high magnification microscope objective could be made from 2 spherical mirrors is that of CR Burch – Proceedings of the Physical Society, 1947, Vol 59(1), 41-46-2.

There is an excellent paper by Seymour Rosin entitled "Inverse Cassegrainian Systems" Applied Optics Vol. 7, Issue 8, pp. 1483-1497 (1968). This paper develops the aberration theory and shows many variants of the 2-mirror system.