OLYMPUS BX-POL

EQUIPMENT OVERVIEW

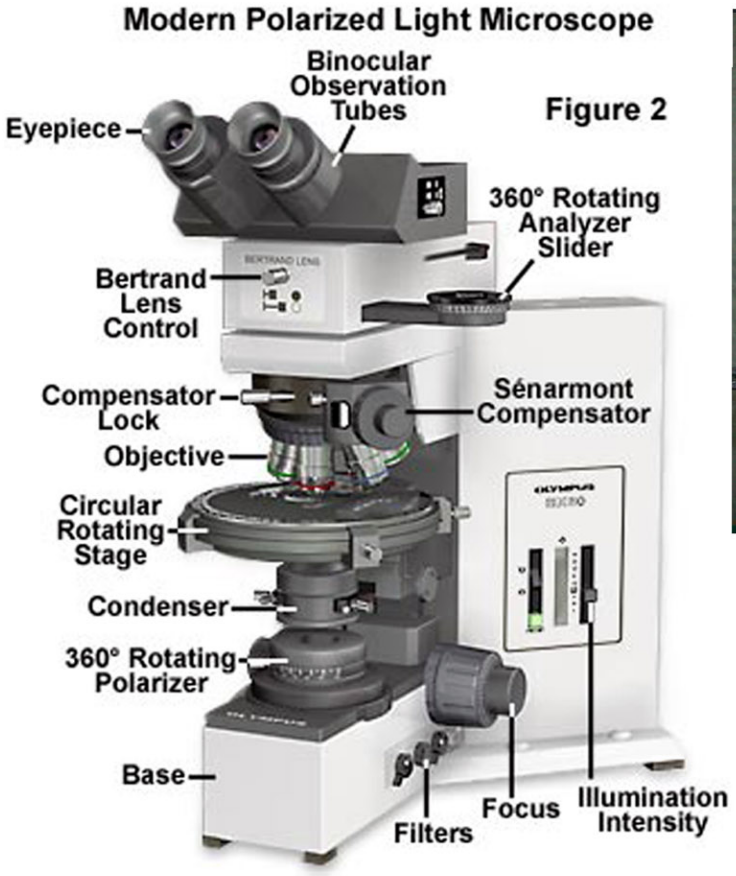
AND

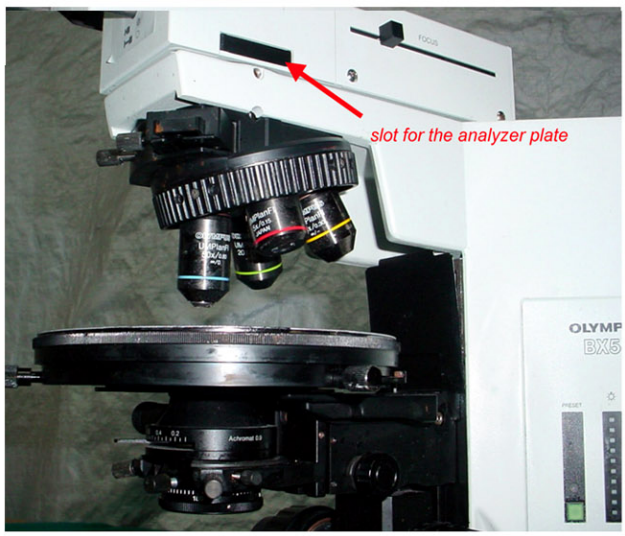
COMMENTS

with additional comments by
J.G. McHone Oct. 2011

OLYMPUS AMERICA

JUNE 28, 1994


Modern Polarized Light Microscope
Figure 2
Binocular Observation Tubes
Eyepiece
360° Rotating Analyzer Slider
Bertrand Lens Control
Compensator Lock
Sénarmont Compensator
Objective
Circular Rotating Stage
Condenser
360° Rotating Polarizer
Base
Filters
Focus
Illumination Intensity


slot for the analyzer plate

Additional comments by J.G. McHone, November 2011

1. The parts described in this brochure were originally developed by Olympus for their new BX-50 and BX-60 stands, announced in March 1993 and also called BX-P and B-MAX. The new pol parts apparently continued unchanged for the later BX-51 and BX-61 stands (BX-2, also BX-3).

2. Centerable nosepiece U-P4RE can have all four holes centered, but one spot may have rubber plugs in its centration holes to indicate it is for the 10x objective, for which the stage might be centered rather than the objective. There is also a U-P6RE 6-place nosepiece with three centerable objective holes (apparently it is rare) and a five-place centerable version called U-P5BDRE. The centration holes can use common 1.5 mm hex key wrenches. I drilled two small holes in the flat area behind the stage to hold the wrenches, an idea after Leitz.

3. The U-ANT insert for the compensator adapter U-TAD can be used in the nose slot instead of the rotatable analyzer U-AN360P (same as "U-360 ANP") in the conoscopic observation module – in that case, a blank slider plate is inserted in the U-CPA.

4. There is also a smaller 142 mm non-ball-bearing centerable rotating stage U-SRG, similar to one of the stages available for the BH-2 line. Unlike the larger BH2 circular stage, the new U-SRP has centering bolts permanently attached. BH2 stages will not fit the BX stand.

5. The BH2 attachable mechanical stage A-FMP can be used in place of U-FMP on the new U-SRP circular stage if the central threaded thumb bolt on the mechanical stage is replaced with one of finer thread (it is a recessed hex head type for the new stage). There can be interference between the x-y dial controls and longer objectives in rear positions, however.

6. Although Olympus originally described all UIS or universal infinity objectives as qualified for polarizing applications, some of these objective lines have a separate P or pol version designation, with red lettering.

7. The U-POC condenser looks and fits like the BH2-POC condenser, but the new U version is described as achromatic aplanatic, meaning it has additional color aberration or focussing corrections as ideal as possible for the new UIS optics.

8. The rotatable analyzer U-AN360P is called U-360 ANP in this brochure (possibly an error). It has a 10x40mm cross section and is intended for the Conoscopic Observation Module U-CPA, unlike the smaller U-AN360, which is for the U-RLA reflection light tube. The later U-AN360P-2 adds a stop-screw bolt to the inserted end.

9. The BX stand can use compensator wave plates from the BH2 line (they are all 6x20mm in cross section) in the U-TAD adapter, except the BH2 Berek compensator does not insert far enough due to its dial end. The new BX plates are plastic and lack the high-quality feel of the metal BH2 plates, although they work well enough. Plates can be left in the out position in the U-TAD adapter, but they extend enough to sometimes get bumped.

Centerable Nosepiece, U-P4RE

The centerable nosepiece accepts 4 RMS-thread objectives. In a departure from conventional design all four positions are centerable. This capability has been provided in order to make it possible for an optical element, other than the objective (e.g. the crossline reticule) to determine the optical axis.

To facilitate user orientation a ring insert is pressed into position around one of the objective centration mounts. If desired this position may be recognized as the reference position. The ring insert is removable.

A set of centration keys are included with the nosepiece.

A 13.5mm x 34mm accessory slot is equipped with an analyzer drawer (for the U-ANT analyzers). When the drawer is removed a DIC-prism may be inserted.

For quantitative polarized light methods the combination analyzer/compensator adapter is inserted (see description on separate page).

Unit Specifications:

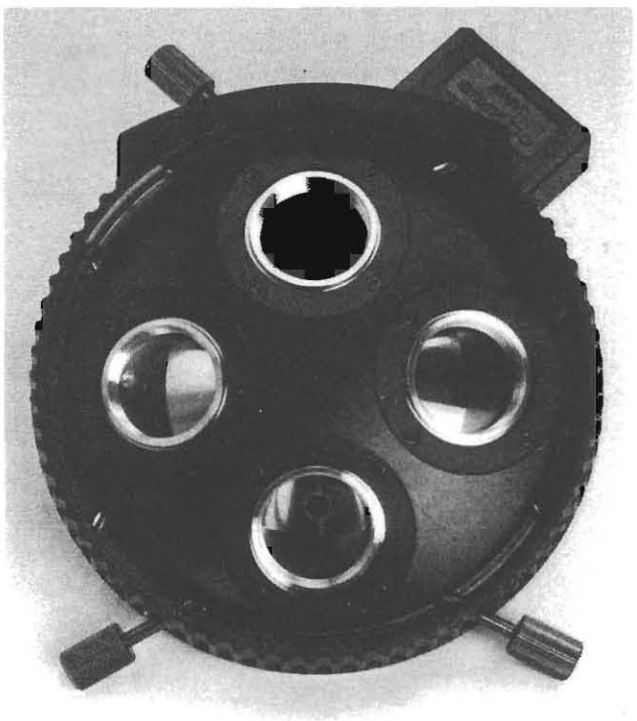
(1) Number of objective positions 4:

(2) Dimensions of objective threads: ISO 8038

Outside diameter: 0.8"
1" = 36 threads
(pitch: 0.706mm)

(3) Rotation system:
Ball bearing

(4) Centration system:
3-point centration
(Centration keys.)
13.5 X 34mm. Clamp screw included. (Use with fixed analyzer, compensator, DIC prism)



Compensator Adapter, U-TAD

The compensator adapter has a cross section dimension of 13.5 x 34mm. It is intended for use with the POL-nosepiece, DIC nosepiece.

The adapter magnetically holds the analyzer (U-ANT) in a fixed N-S orientation and simultaneously holds one of the compensators in its DIN-standard (6 x 20mm) compensator slot.

Unit Specifications:

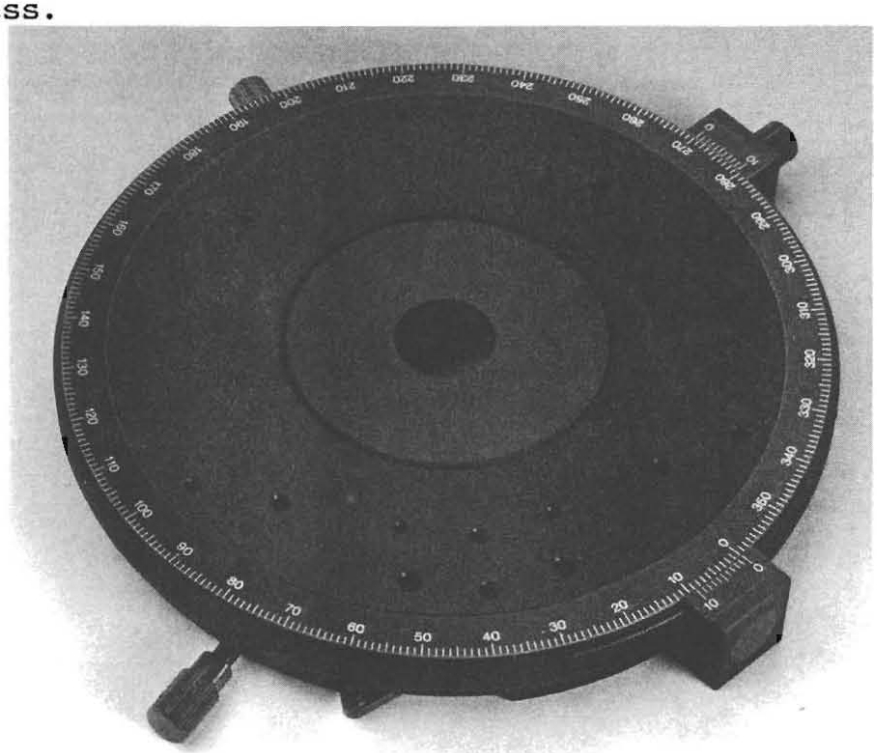
(1)	Nosepiece Mount:	Slot, w/clamp (13.5 x 34mm)
(2)	Analyzer Mount:	Drop in, w.magnet (U-ANT)
(3)	Applicable analyzer dimensions:	6 x 20mm, Click stop

Centerable Rotating Stage, U-SRP

The circular centerable rotating stage is equipped with precision ball bearings for accurate rotation. 360° peripheral graduations are clearly visible and can be read to 1/10 degree (6 minutes of arc) with either of two verniers spaced 90° apart. The stage platform has a central insert and is ready to accept stage clips, mechanical stage and other accessories. A lever engages 45 degree interval click stops.

The stage is mounted onto the existing stage ring dovetail of the B-MAX stands. This convenience makes a special "Pol only" stand unnecessary and provides, as a bonus, stage centerability.

In the near future all B-MAX stands will have a dovetail (center notch) to insure against any unintentional stage rotation during the centration process.

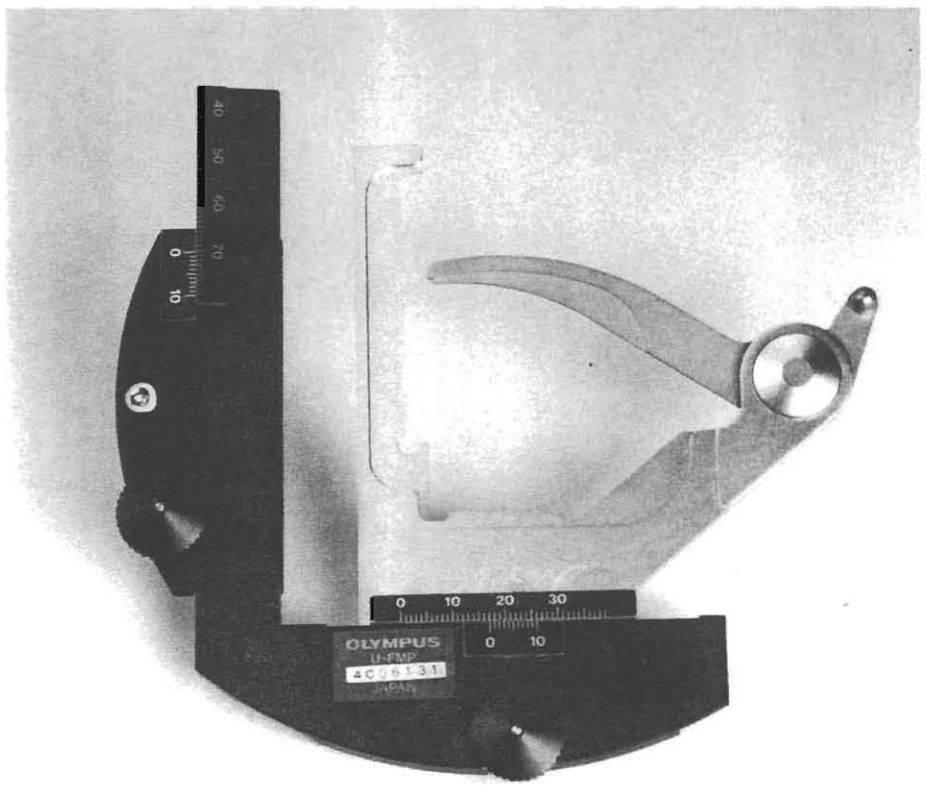


Unit Specifications:	(1) Rotation system:	Ball bearing
	(2) Rotation:	360° rotation, clamping screw click stop every 45°
	(3) Graduation:	Graduated 360° at 1° intervals, vernier reading to 6'.
	(4) Centration:	3-point centration.

Attachable Mechanical Stage, U-FMP

The attachable mechanical stage is oriented to the platform of the rotating stage (U-SRP) with two locating pins. It is held in place with an Allen screw.

The attachable mechanical stage accepts standard (1" x 3") slides and half size (1" x 1.5") slides common in petrography. The holder has a low contour for "edge of the slide" observation. A locating scale with vernier is provided for x and y directions.



Objectives for Quantitative Polarized Light

Three sets of quantitative UIS polarized light objectives are now available as follows:

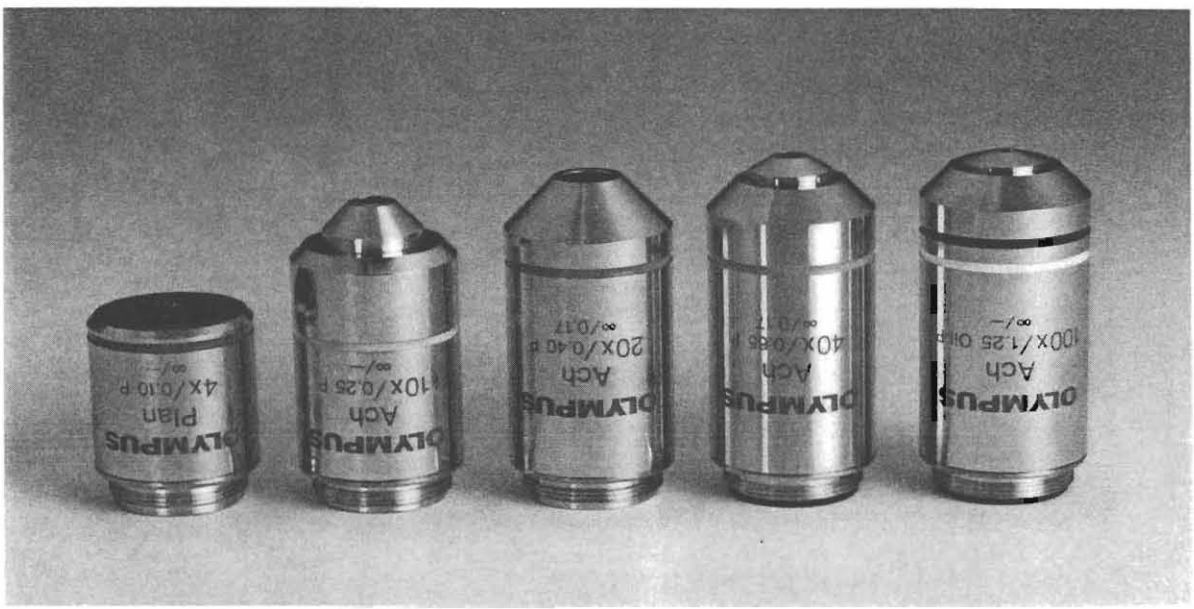
Quantitative POL - ACHROMATS	4/10/20/40/100x
Quantitative POL - U-PLAN FL	4/10/20/40/100X
Quantitative POL - U-MPLAN FL	5/10/20/50/100x (NEO, THREAD, USE STANDARD NOSEPIECE)

It is important to note the truly extraordinary performance (and price!!) of the new Pol - objectives with equivalent correction levels!

The objectives for quantitative polarized light differ from those for qualitative polarized light applications.

a) Internal to the objectives the mounting of the lens elements is accomplished in a particularly non straining fashion; Special design measures as well as great care and skill during assembly make this possible.

b) Externally the objectives are marked with red inscription, signifying their special pol capability. In other respects these objectives perform exactly like their counterparts from the standard objective line. (N.A. is minimally reduced in some cases).



Polarized Light Condenser, U-POC

The stainfree pol condenser is an achromatic aplanatic swing out type with a 0.9 maximal aperture. Objective magnifications below 10 x are evenly illuminated with the top element swung out. With the top element swung out the aperture functions are reassigned! The aperture diaphragm acts as field stop and vice versa.

Aperture graduations indicate real NA values.

The high transmission/high extinction built-in polarizer can be rotated by 360°. The polarizer orientation scale is subdivided into 5° intervals. The zero setting can be calibrated and fixed.

Unit Specifications:

(1)	Type:	Achromatic/aplanatic top lens swing-out system.
(2)	Numerical aperture:	0.9, 0.2
(3)	Illuminating area:	3mm (NA=0.9), 14mm(NA=0.2)
(4)	Focal length:	13.1mm (NA=0.9), 229mm (NA=0.2)
(5)	Mount to microscope body:	Circular dovetail, with clamping screw.
(6)	Aperture function:	By lever.
(7)	Polarizer function:	Rotation dial, locking screw 0° degree position adjustable click-stop.

CONDENSER COMPARISON

	BH2	NX2,Y2	ZSKOP	BX
NA	0.9/0.25	0.9/0.22	0.63/0.22 1.4/0.32	0.9/0.2
Ob. Mag	10–100 / 2–4	10–100 / 2–4	20–100 / 2.5–10	10/100 / 2–4
Illum field		3.4 / 12		3/ 14
Polar– izer	Fixed under condenser 360° rotation	Removable 360° rotation	Removable 360° rotation	Fixed under condenser 360° rotation

Rotatable Analyzer, U-360 ANP

The rotatable analyzer, which may be used with the orthoscopic and conoscopic modules has a cross section of 10mm X 40mm. One open and one analyzer position are provided which click stops marking the engaged and disengaged positions; The circumference of the rotating dial is subdivided into a 180° degree scale; its vernier allows angular reading of 1/10 degree (6 minutes of arc).

Unit Specifications

Rotation:	Dial, unrestricted, rotation, lockable.
Graduation:	180 degree intervals per full rotation.
Vernier:	Reading to 1/10 degree (6' of arc)

COMPENSATORS

Our product offering has been expanded to include an extensive selection of the most popular compensators:

U-T530	-	Full Wave Plate
U-T137	-	Quarter Wave Plate
U-CSE	-	Senarmont Compensator
U-CWE	-	Quartz Wedge 1-4 orders
U-CBE	-	Berek Compensator, 3 lambda
U-CTB	-	Berek Compensator, 20 lambda
U-CBR	-	Brace Koehler Compensator 1/10 lambda
U-CBR2	-	Brace Koehler Compensator 1/30 lambda

All compensators of the B-Max series have standard DIN dimensions. The DIN standard defines the cross section of the compensator slides and the distance to the optical axis.

The B-MAX is compatible with compensators from the BH2 and compensators from other manufacturers. With non Olympus compensators the click stop position may not be accurate.

Specification Overview

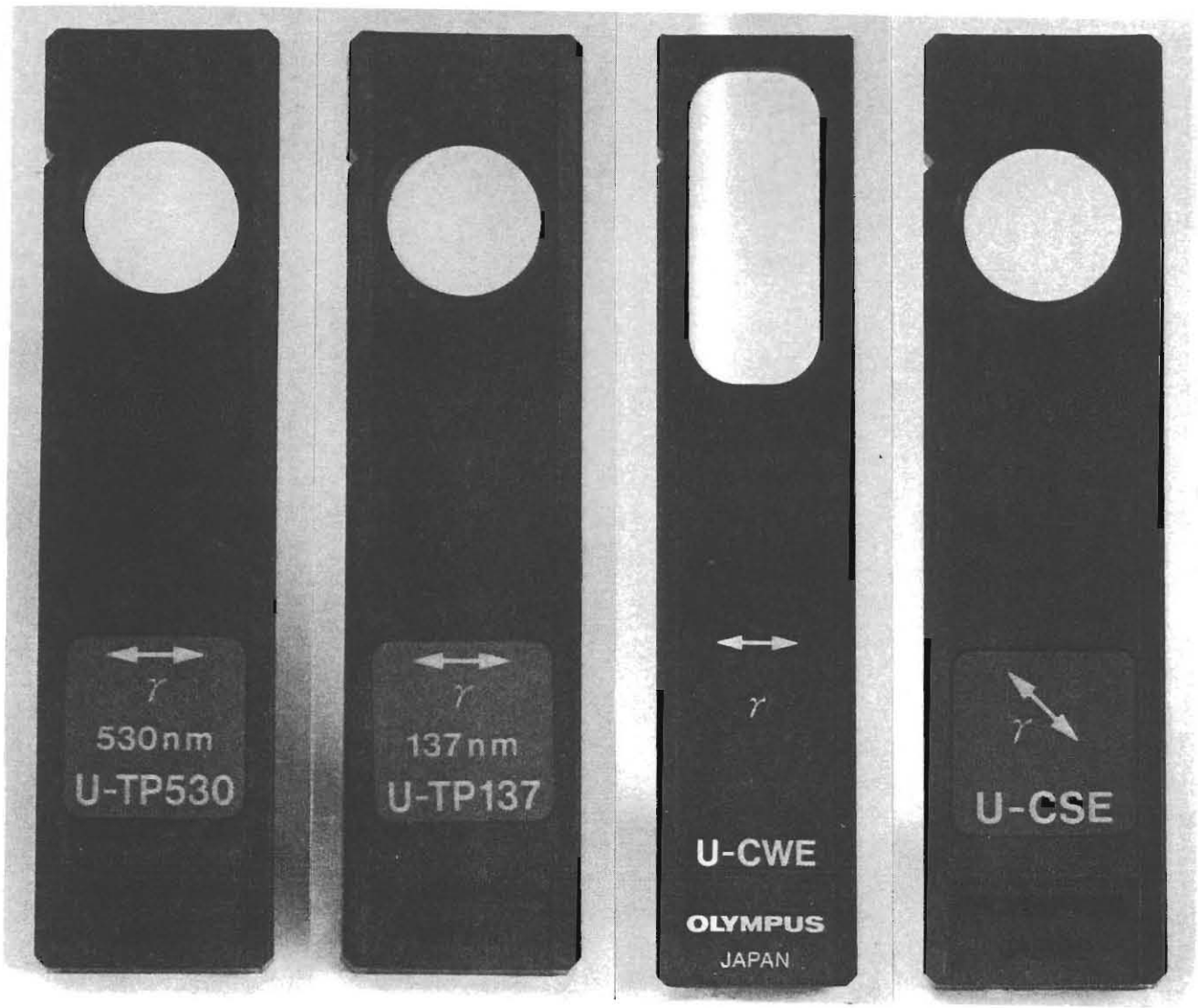
COMPENSATOR	MEASURING RANGE	ACCURACY	BH2	BX	USES
Thick Berek	0 ~ 20	± 50nm	X	O	Measurement of pressure of polymer membrane. Quantative measurement of photoelasticity. Measurement of refraction index of crystals.
Berek	0 ~ 32	± 50nm	0.1° vernier scale	0.05° direct reading	Measurement of pressure of polymer memrane Quantative measurement of photoelasticity Live organ observation
Senarmont	0 ~ 1	± 1nm	X	O	Live organ observation
Brace-Koehler 1	0 ~ 1/10	± 0.2nm	X	0.1° direct reading	Live organ observation (Cell, Chromosome)
Brace-Koehler 2	0 ~ 1/30	± 0.1nm	X	0.1° direct reading	
Quartz Wedge	1 ~ 4	100nm?	X	1-4	Refraction measurement =546.1nm (e-line)

FULL WAVE PLATE "SENSITIVE TINT"

QUARTER WAVE PLATE

QUARTZ WEDGE

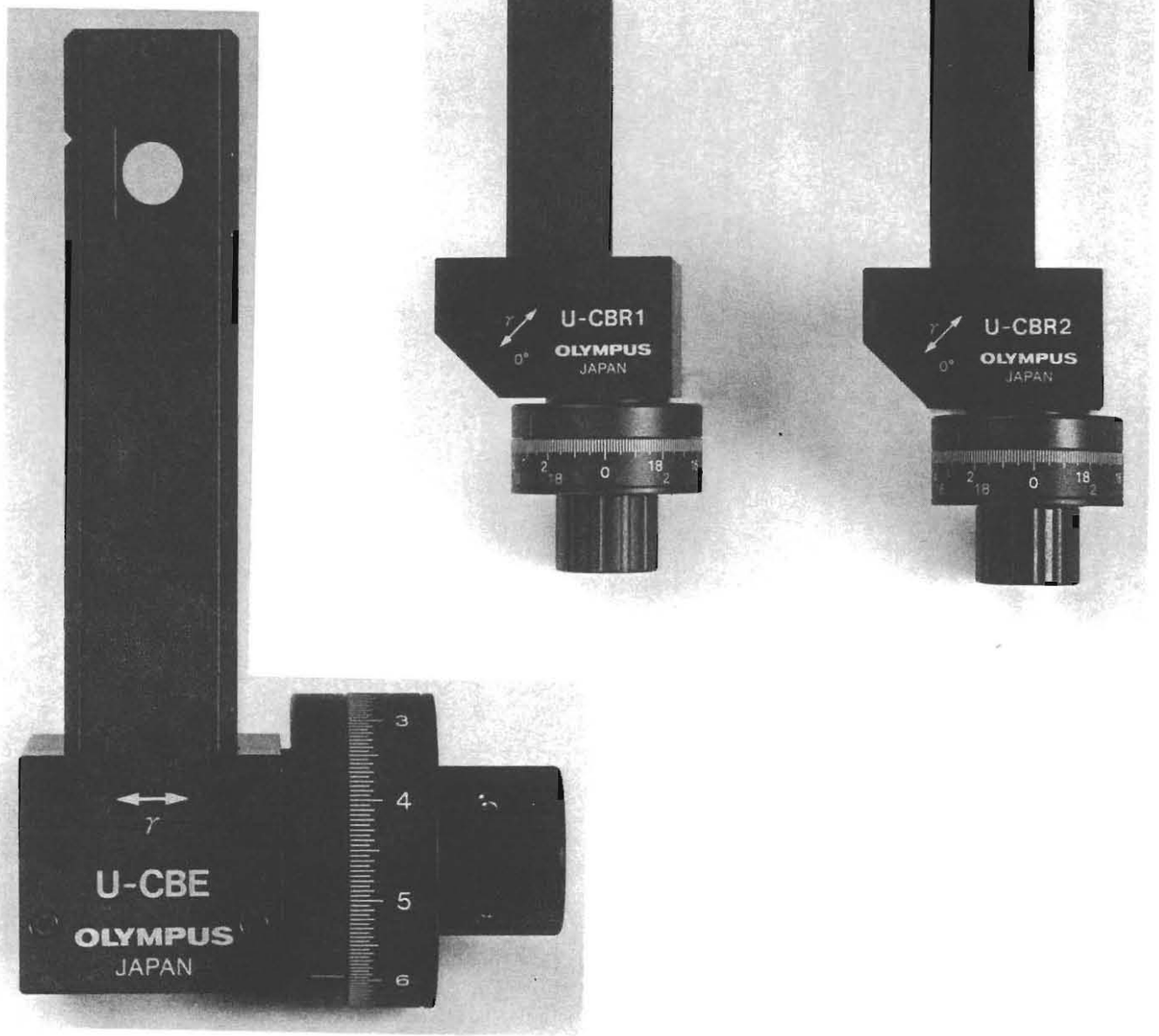
SENARMOUNT COMPENSATOR



BEREK COMPENSATOR,
3 Lambda

BRACE KOEHLER
1/10 Lambda

BRACE KOEHLER
COMPENSATOR
1/30 Lambda



COMPENSATORS SPECIFICATION OVERVIEW

Tint Plates (U-TP530, U-TP137)

(1) Dimensions: 6 x 20mm

Senarmont Compensator (U-SEC)

(Used with U-AN360P)

(1) Dimensions: 6 x 20mm
(2) Measuring range: 1 lambda

Berek Compensator (U-BEC)

(1) Dimensions: 6 x 20mm
(2) Measuring range: 3 lambda
(3) Optical element inclination: +/- 30°, dial rotation
(4) Graduation: Vernier reading to 0.05°

Quartz Wedge Compensator (U-WEC)

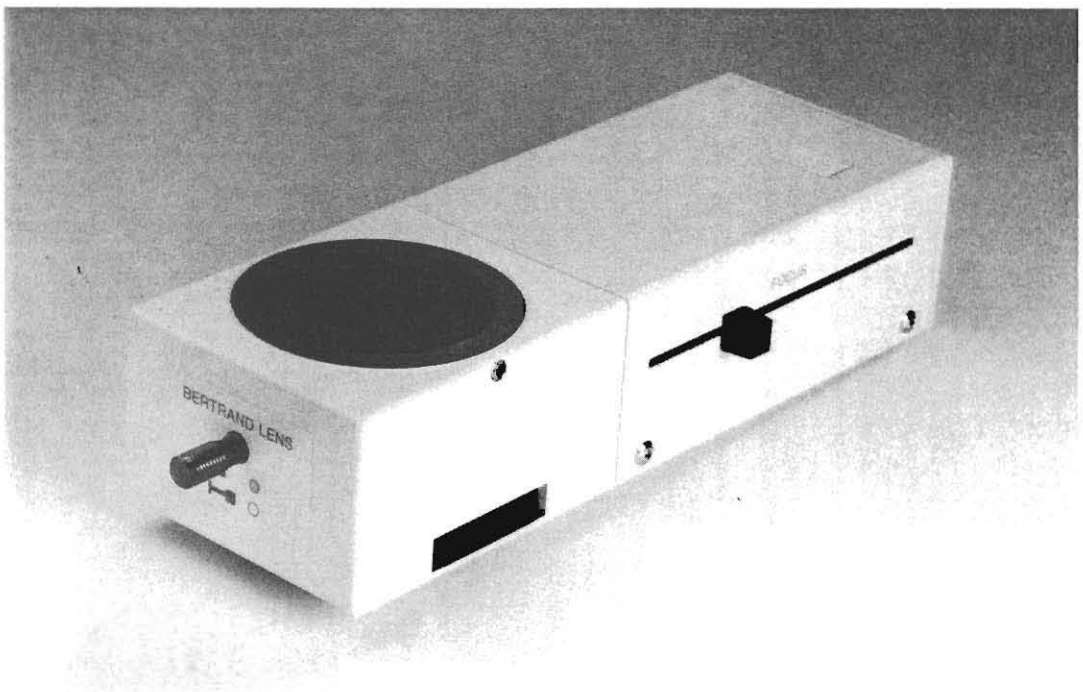
(1) Dimensions: 6 x 20mm
(2) Measuring range: 1 - 4 lambda
(3) Graduation: Orientating lambda interval graduation.

Brace - Koehler Compensator (U-BRC1, U-BRC2)

(1) Dimensions: 6 x 20mm
(2) Measuring range: 1/10 lambda, 1/30 lambda
(3) Optical element rotation: +/- 40°, dial rotation
(4) Graduation: Vernier reading to 0.1°

Conoscopic Observation Module, U-CPA

The conoscopic observation module contains a disengageable Bertrand lens. Both orthoscopic and conoscopic observation are possible. The Bertrand lens is focussed by a moving lever; the adjustment range covers applications with and without intermediate attachments. The built in Bertrand lens aperture increases the contrast of the conoscopic image. The 10mm x 40mm analyzer slot receives the rotatable analyzer U-AN 360P.



Unit Specifications

(1)	Conoscope magnification:	0.77
(2)	Bertrand diaphragm diameter:	2mm
(3)	Depth of focus:	+/- 14mm
(4)	Orthoscope/conoscope change:	PUSH, PULL lever.
(5)	Analyzer slot:	40 x 10mm with clamping screw. (Use with/AN360P)
(6)	Thickness of intermediate tube:	47mm

PERFORMANCE OF THE CONOSCOPE MODULE

1) Total performance is better than Nikon and BH2
2) Contrast is improved by the Betrand lens aperture.
3) Photographic capability.
4) Incident light conoscopic observation is possible.
5) The new components can be used in combination with other intermediate tubes.
6) Each observation method can be selected by quick change.

	BH2	NIKON	Z(SKOP)	Z(PHOTO)	BX
BERTRAND LENS APERTURE	X	X	O	O variable	O
FOCUSING	O	X	O	O	O
CENTERING	X	X	X	O	O via stage and nosepiece
PHOTOGRAPHIC	O	O	O	O	O
TOTAL PERFORMANCE	NIKON = BH2 < BX < ZEISS				

Orthoscopic Observation Module, U-OPA

The U-OPA is a cylindrical adapter of 30mm height, fitting between stand and observation tube. The slot size of this unit (10mm X40mm) is dimensioned to receive the rotatable analyzer U-AN360 P. A built in inclined high order white plate (depolarizer) assures equal image intensity and quality for binocular/trinocular ports.

Orthoscopic observation:

1) Highly accurate rotatable analyzer can be used.
2) Intermediate adapter is designed for polarization.
3) The new components can be used in combination with other intermediate tubes.
4) Greater variety of accessories. Range of retardation measurement has been improved.

Unit Specifications:

1) Analyzer slot:	40 x 10mm with clamping screw. (Use with/AN360P)
2) Height	30mm