

Microscope Components for OEM Integration



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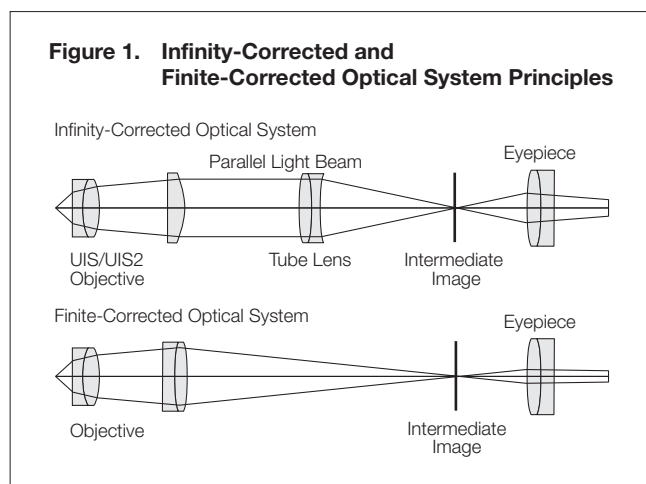
Welcome to UIS2 Optics

UIS2:

Maximize the Advantage of Infinity-Corrected Optics

What are infinity-corrected optics?

The UIS2 infinity-corrected optical system is designed so that light passes from the specimen through the objectives without forming an image along the way. Instead, light travels in the form of parallel rays to the tube lens, is focused by the tube lens, and forms an intermediate image. In finite-corrected optics, the intermediate image is formed by the objective without a tube lens.



Advantages of Infinity-corrected Optics

Infinity-corrected optics offer a number of advantages:

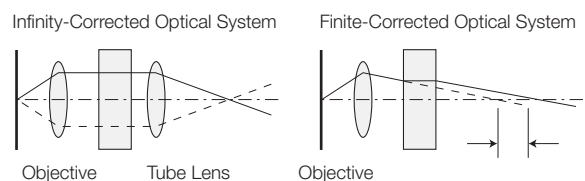
- There is no change in magnification, even when the distance between the objective and tube lens is altered.
- Because the total magnification remains constant, there is no image aberration — even when prisms or sliders are interposed between the objectives and the tube lens.

The advantages of UIS2 infinity-corrected optics are important when designing the ideal microscope optical system. With infinity-corrected optics, users can freely insert or remove intermediate attachments in the parallel rays of light between the objectives and tube lens, enabling the creation of user-specific

or task-specific optical systems. To establish real flexibility with such a system, it is necessary to eliminate coma aberration. **

***In UIS2 objectives, the parfocal distance is designed at 45 mm and the focal length of the tube lens is 180 mm.*

Figure 2. Advantages of Infinity-corrected Optical System

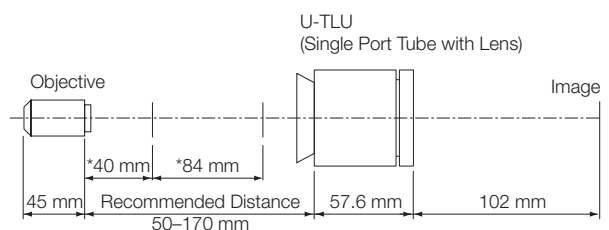


Basic Dimensions in the UIS2 Optical System

The UIS2 optical system corrects aberration with a dedicated telan lens and eyepiece; coma aberration and flatness are not degraded even when the telan lens' exit pupil position is modified by changing the objective and telan distance. This makes it possible to use a distance of 50 mm to 170 mm from the objective mounting position to the single port tube with lens.

**See definition in the optical terminology section.*

Figure 3. Basic Dimensions of UIS2 Optical System



**Basic dimensions when our revolving nosepiece and illuminator are combined. When the position of the illuminator is changed, the illuminator's performance cannot be maintained.*

Features of UIS2 Objectives

UIS2 objective lenses are compatible (in both screw diameter and optical performance) with the UIS optical system and offer the following features as compared to conventional objectives.

1. Wavefront Aberration Control

Olympus UIS2 objectives push the boundaries of performance with wavefront aberration control, high numerical apertures (NA), and long working distances. Our objectives are designed to provide splendid performance by minimizing the aberrations that reduce resolution.

****See definition in the optical terminology section.*

2. Objective Lenses with Splendid Image Parcentricity

Semi Apochromatic UIS2 objectives have splendid parcentricity. When a user changes objectives by rotating the nosepiece, the center of the field of view does not change on the digital camera (50X magnification or higher in the MPLFLN and LMPLFLN series objectives).

3. Improved Color Reproducibility

UIS2 objectives realize true color reproduction without chromatic shifts using specially selected high-transmittance glass and advanced coating technology. These features provide high transmittance that is flat over a wide-band wavelength. Because the entire optical system, including the tube lens, is designed to reproduce a true color users know that they can obtain realistic images of the specimen even without using a digital microscope camera.

4. Reduced Weight

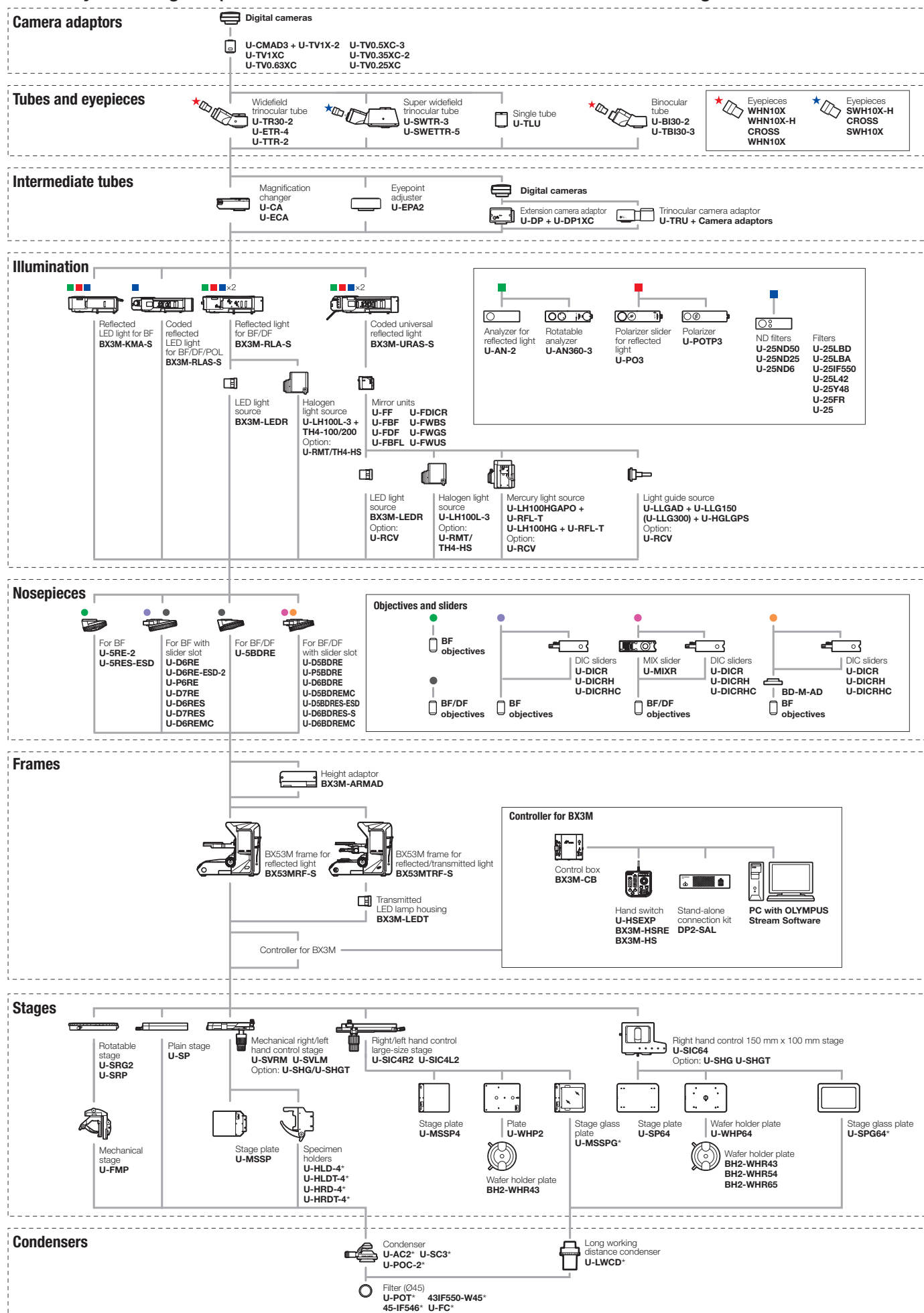
UIS2 objectives (MPLFLN and LMPLFLN series) feature an aluminum objective barrel cover, reducing their weight to approximately 2/3 that of conventional objectives. This lightens the load on devices when the objectives are moved up and down, suppressing vibrations by lowering the inertia generated when users switch objectives.

5. Lead and Cadmium Free

UIS2 objectives are made from lead- and cadmium-free eco-glass.

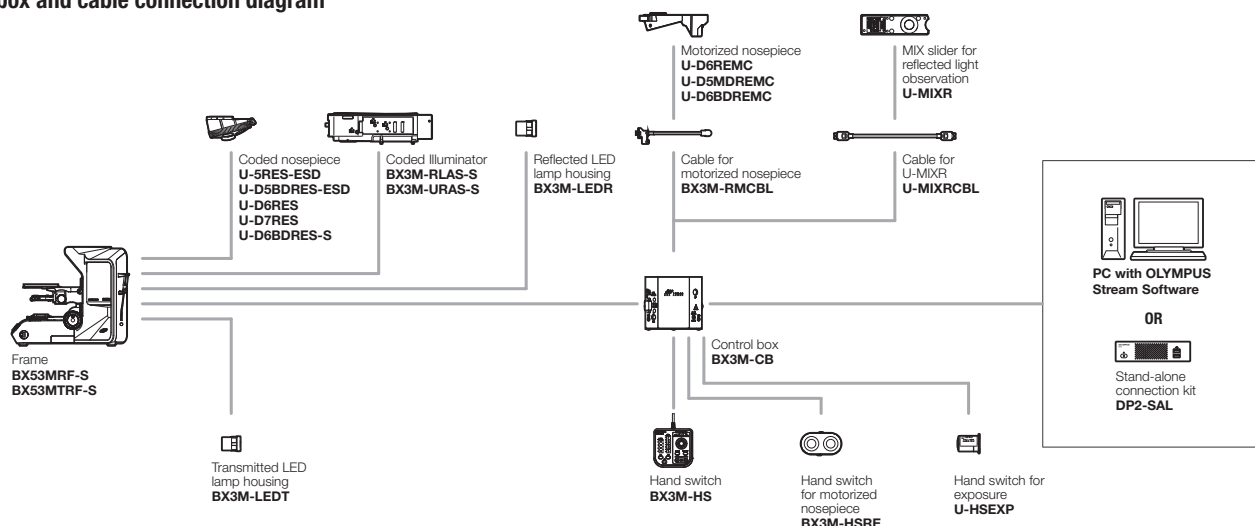
System Diagram

BX53M System Diagram (for Reflected and Combination Reflected/Transmitted Light)

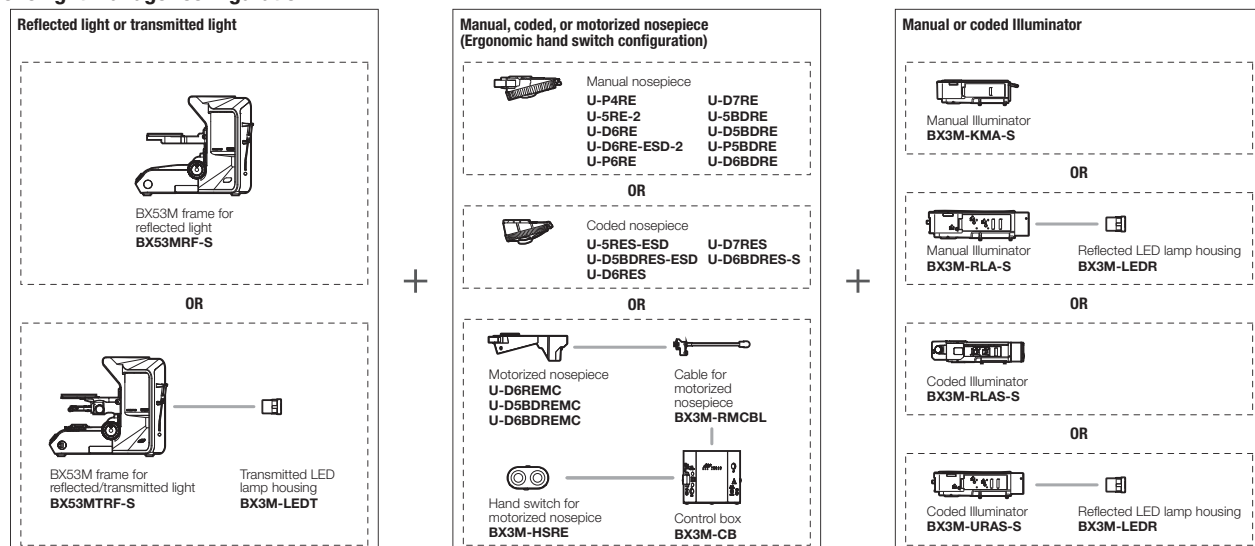


*For transmitted light combination only

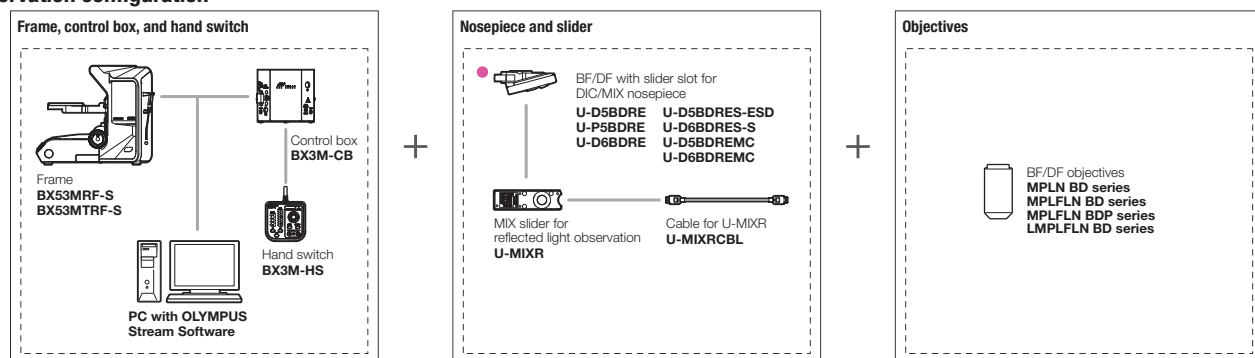
Control box and cable connection diagram



Stand-alone light manager configuration

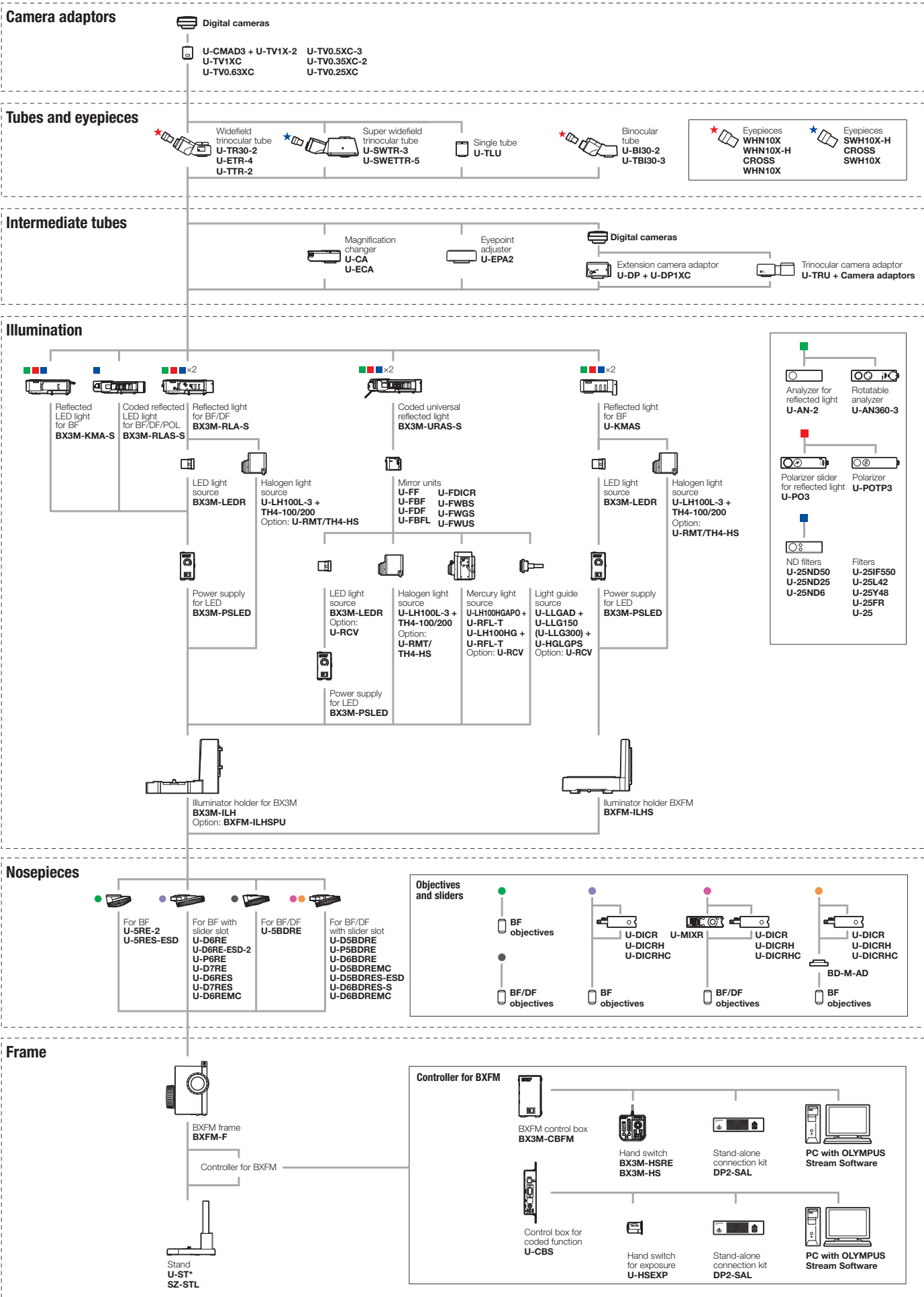


MIX observation configuration



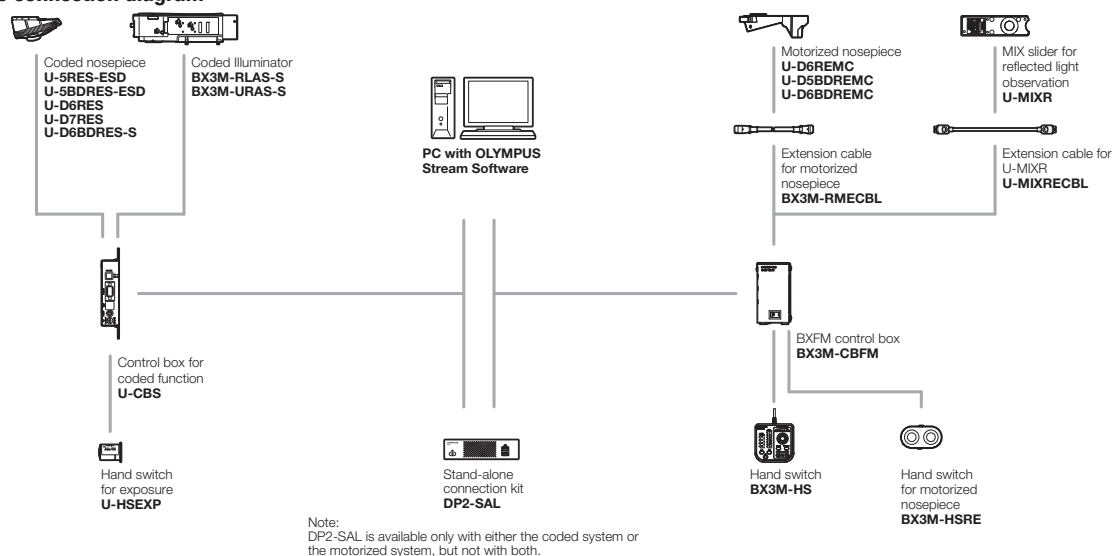
System Diagram

BXFM System Diagram

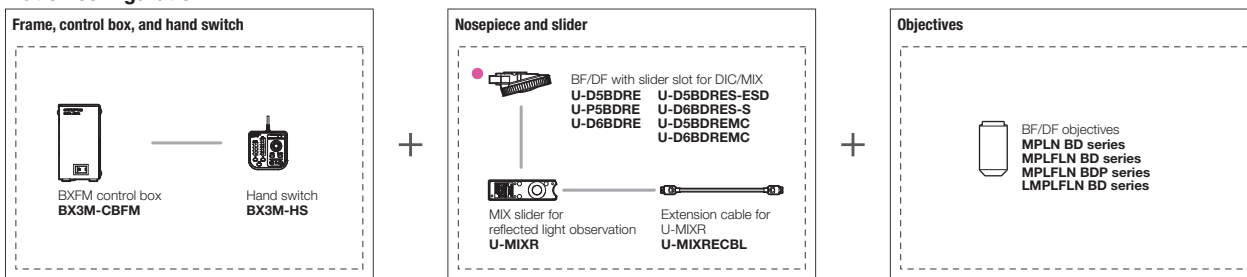


*U-ST is not available with BX3M-ILH.

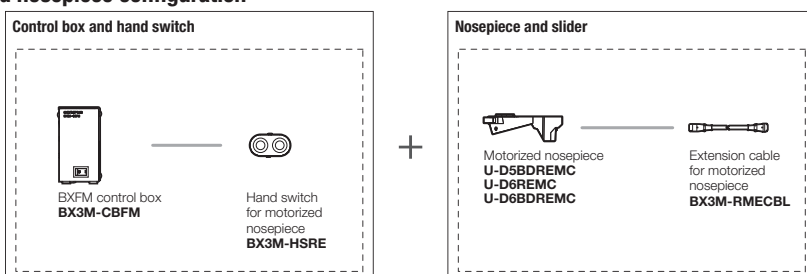
Control box and cable connection diagram



MIX observation configuration

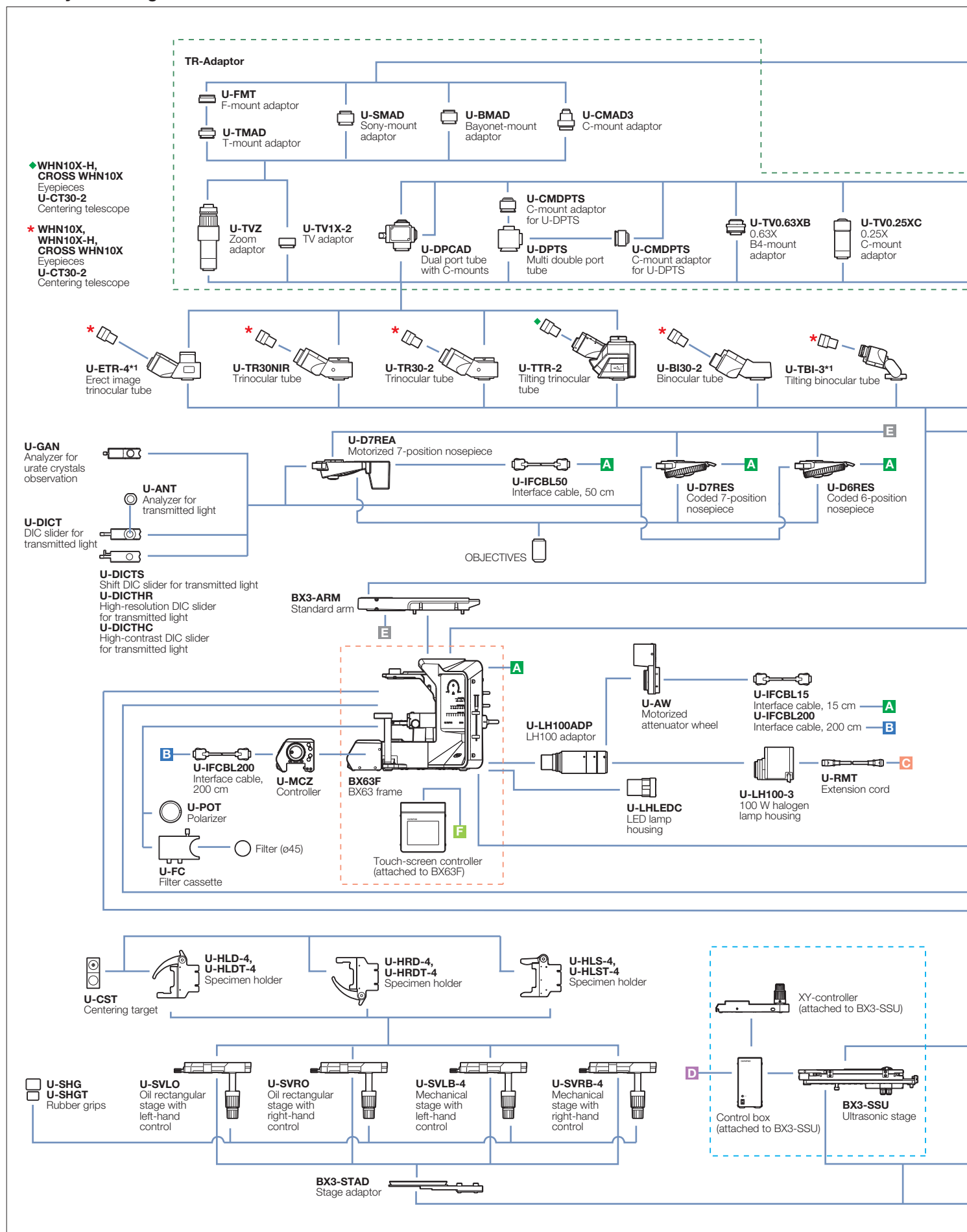


Motorized nosepiece configuration



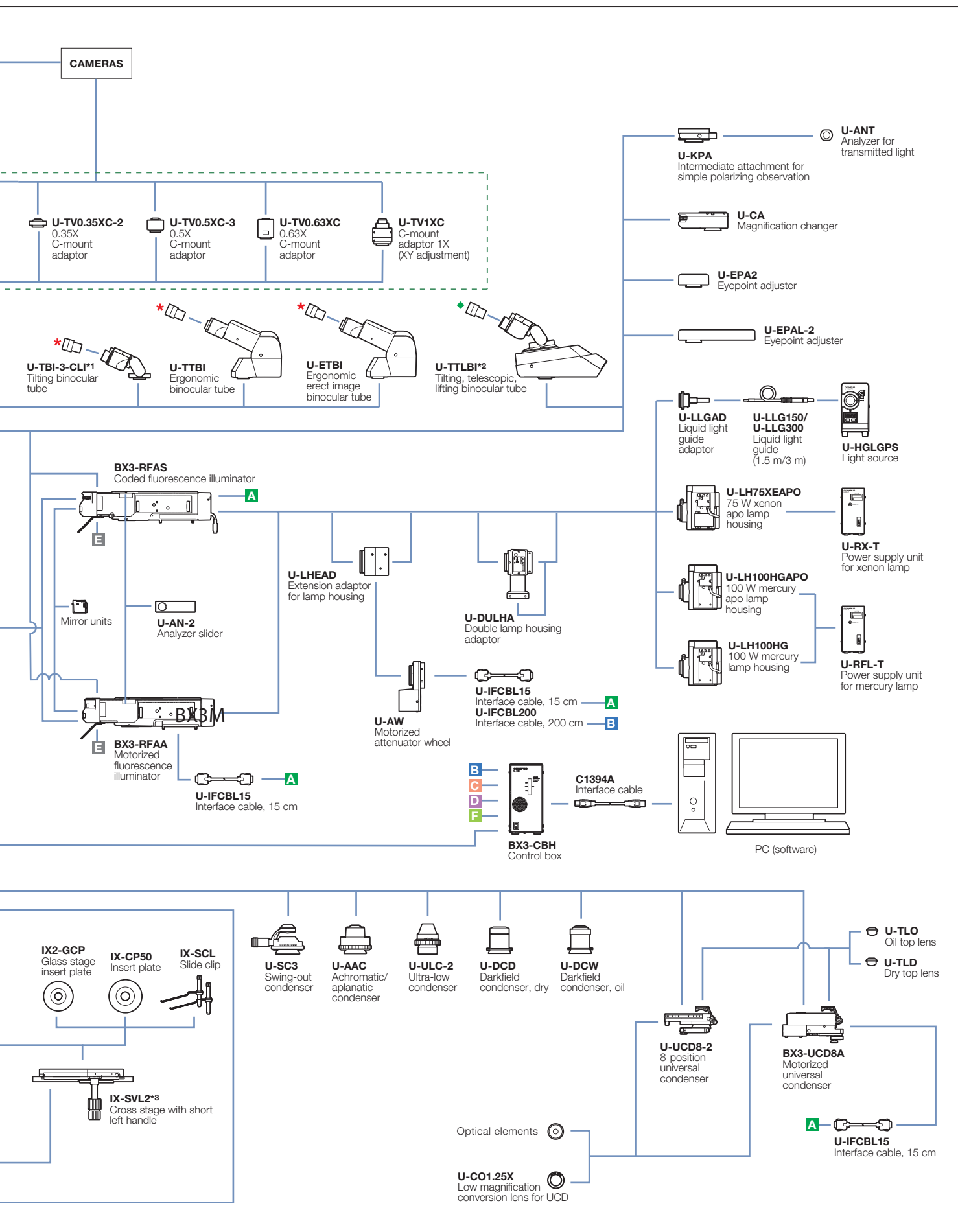
System Diagram

BX63 System Diagram



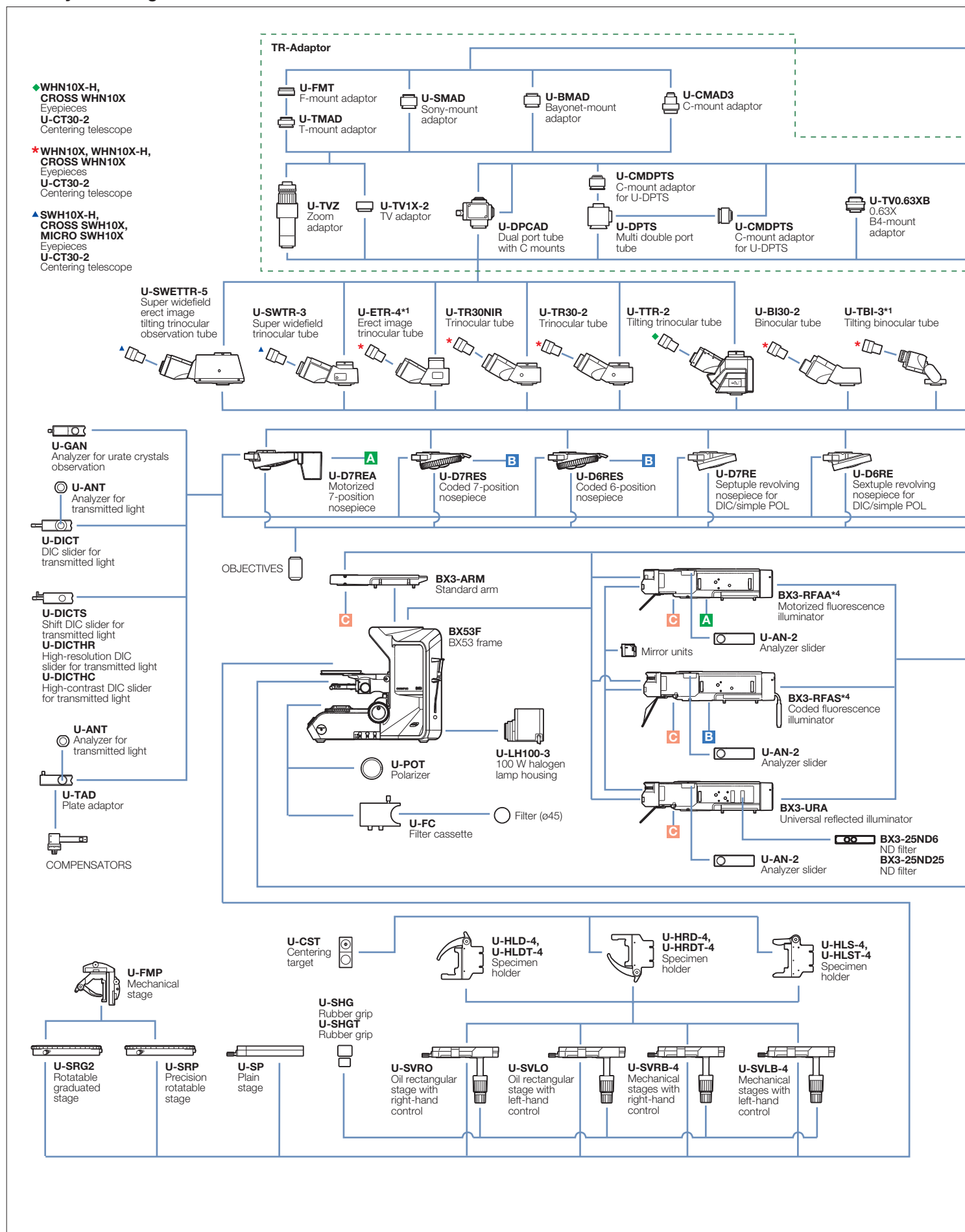
*1 Slight vignetting may occur in combination with an additional intermediate attachment or fluorescence illuminator. *2 Requires an additional intermediate attachment or fluorescence illuminator.

*3 Cannot be used with BX3-UCD8A and U-UCD8-2



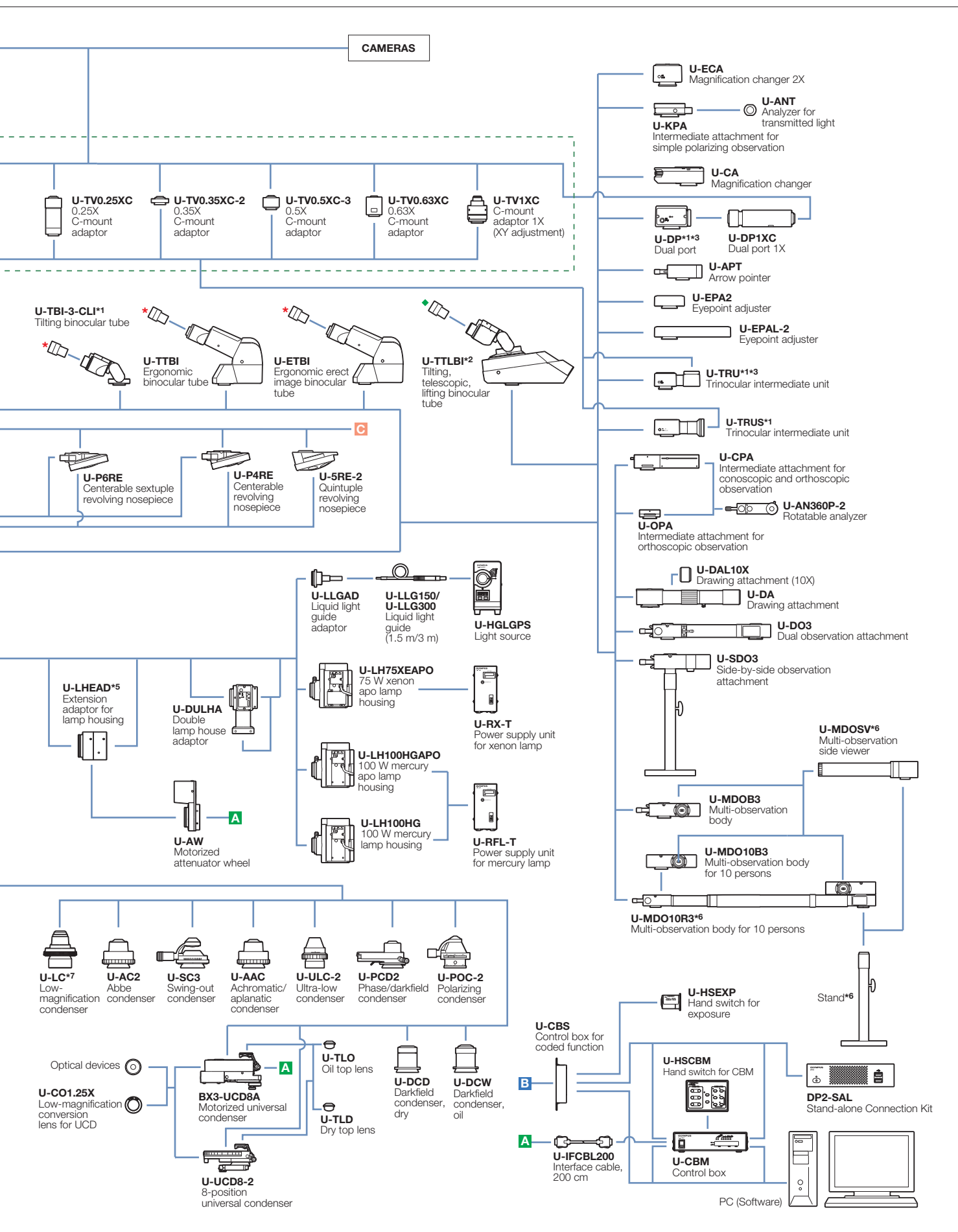
System Diagram

BX53 System Diagram



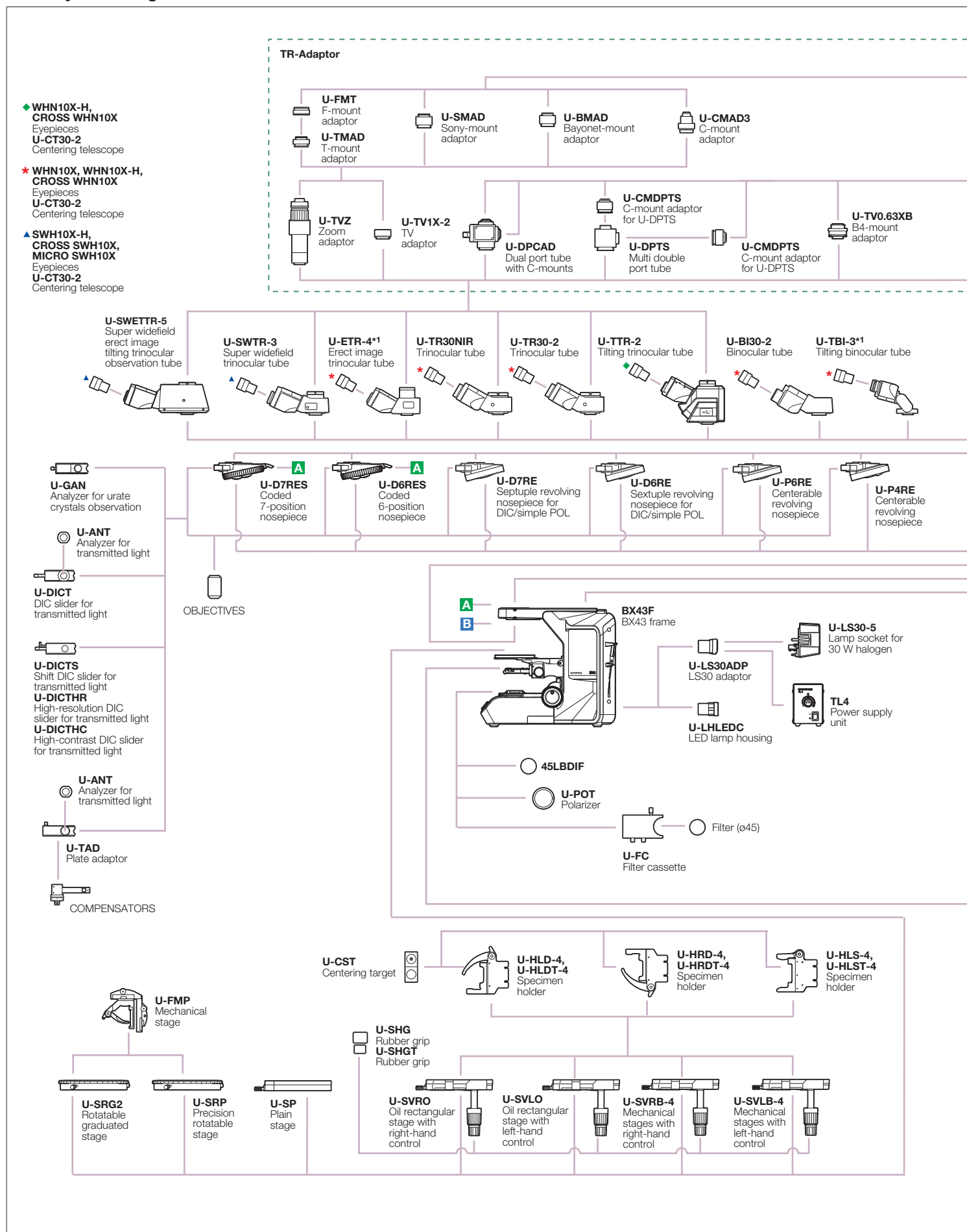
*1 Slight vignetting may occur in combination with an additional intermediate attachment or observation method. *2 Requires an additional intermediate attachment or fluorescence illuminator.

*3 Cannot be used with U-TTLBI. *4 Compatible with FN 22. *5 Cannot be used with BX3-URA. *6 Stand is standard equipment with the U-MDOSV and U-MDO10R3. *7 An auxiliary lens is equipped.



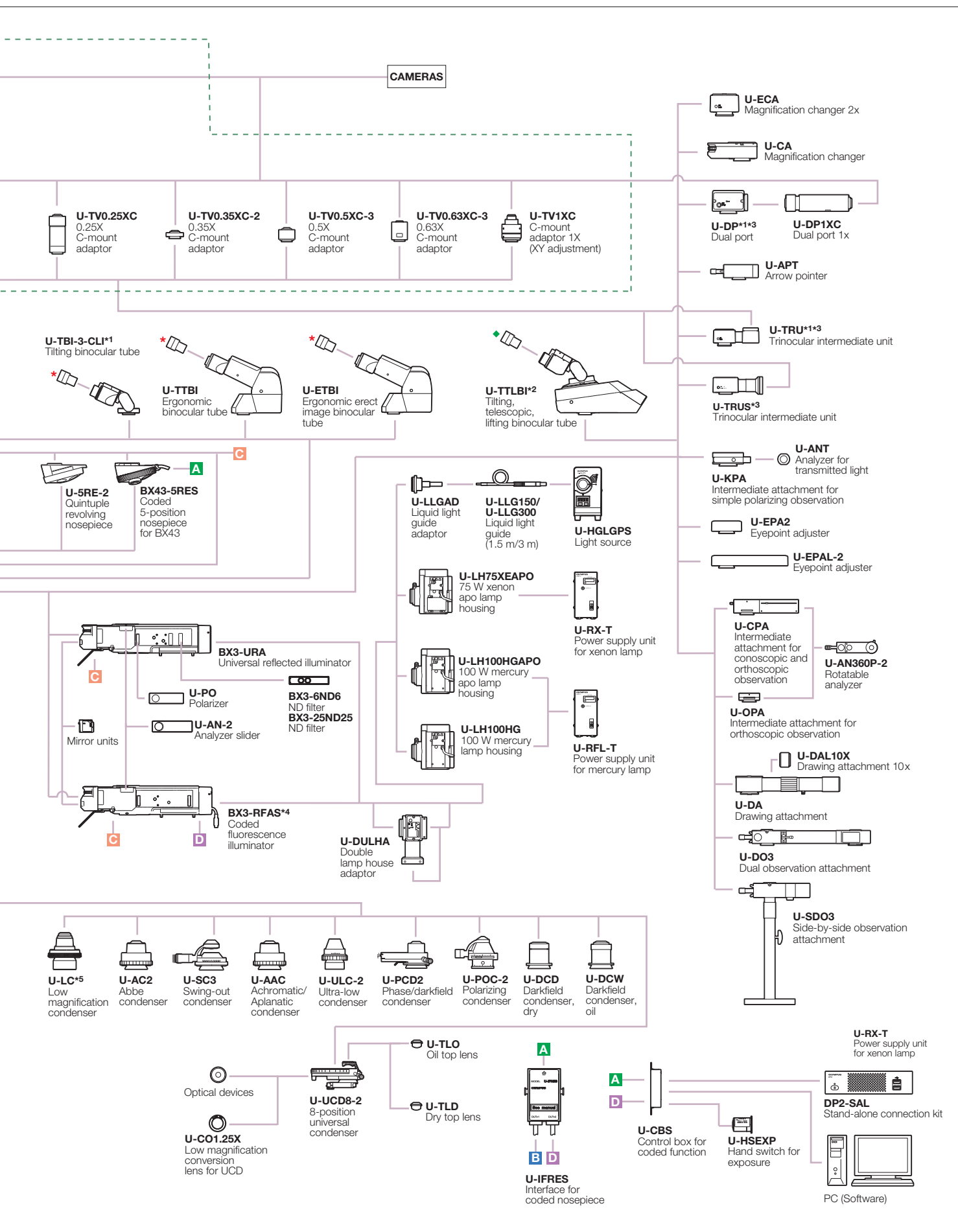
System Diagram

BX43 System Diagram



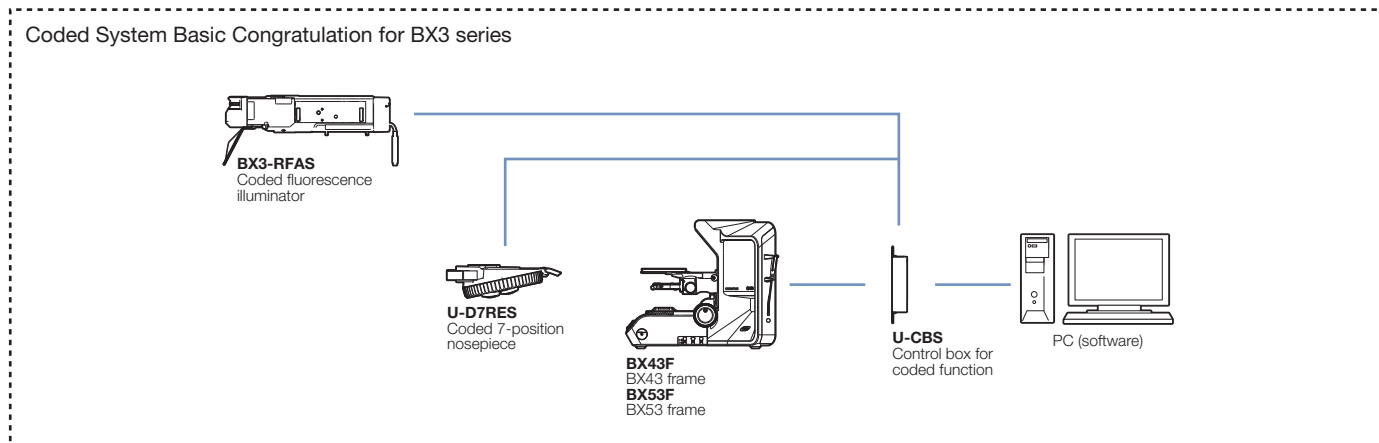
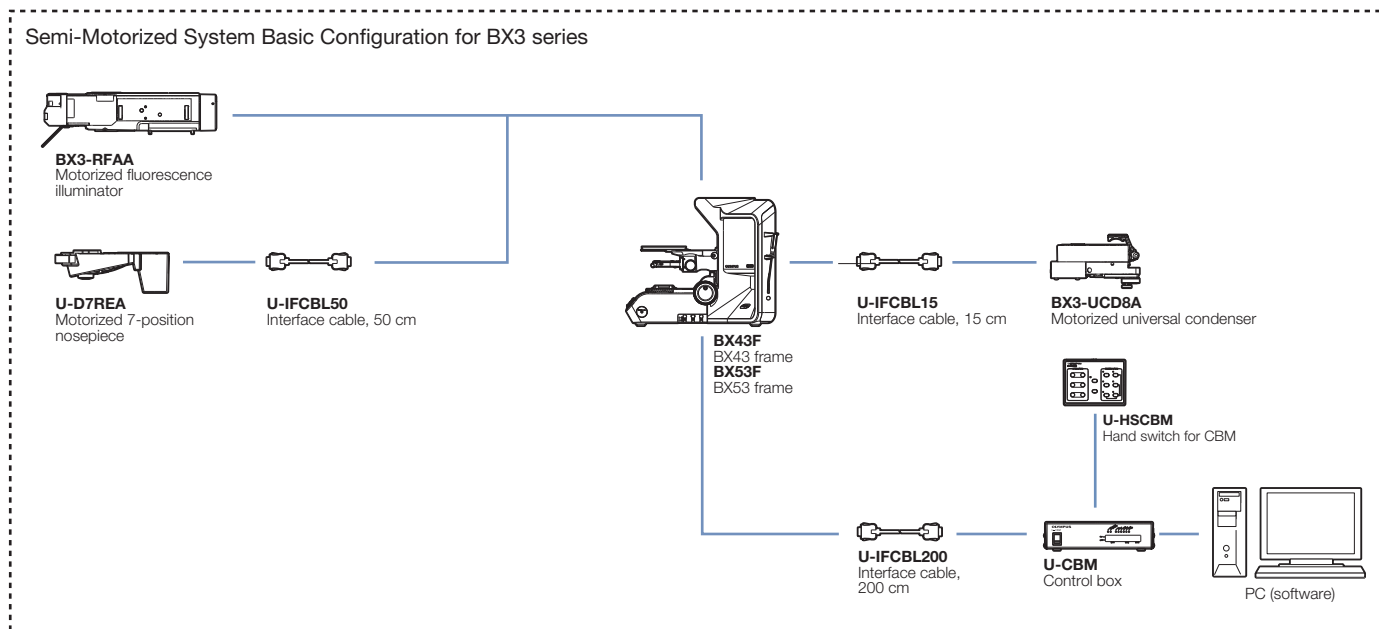
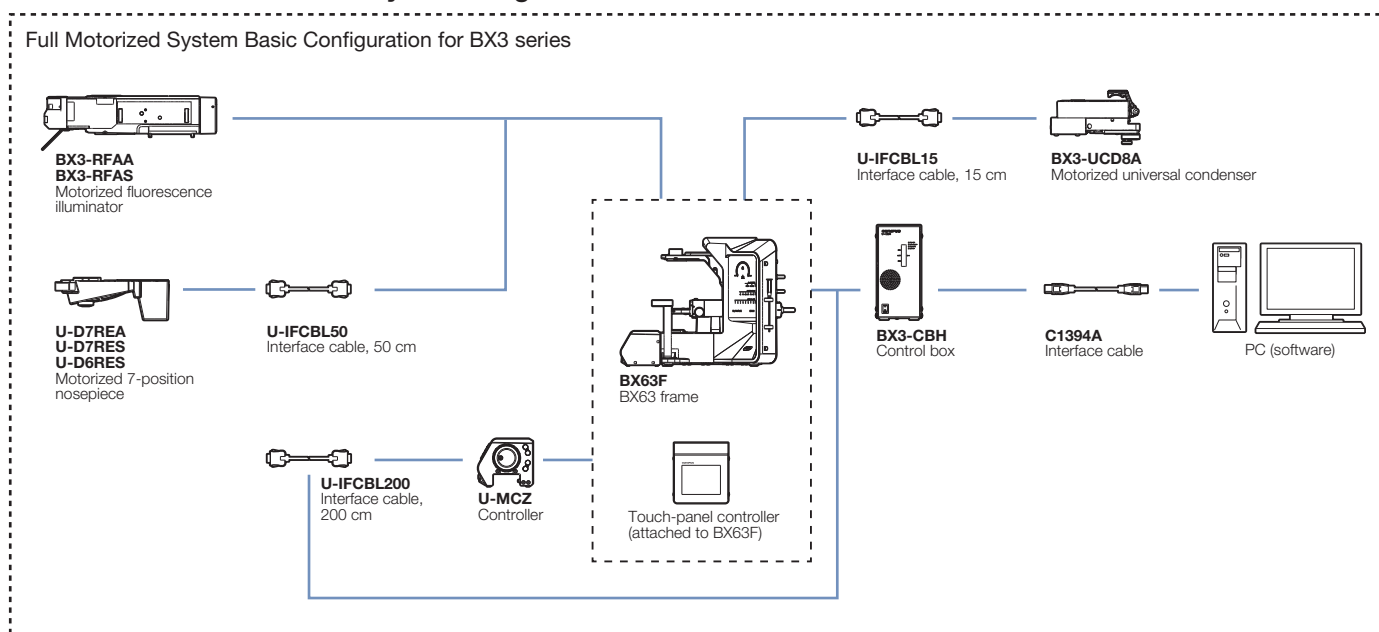
*1 Slight vignetting may occur in combination with an additional intermediate attachment or observation method. *2 Requires an additional intermediate attachment or fluorescence illuminator.

*3 Cannot be used with U-TTLBI. *4 Compatible with FN 22. *5 An auxiliary lens is equipped.



System Diagram

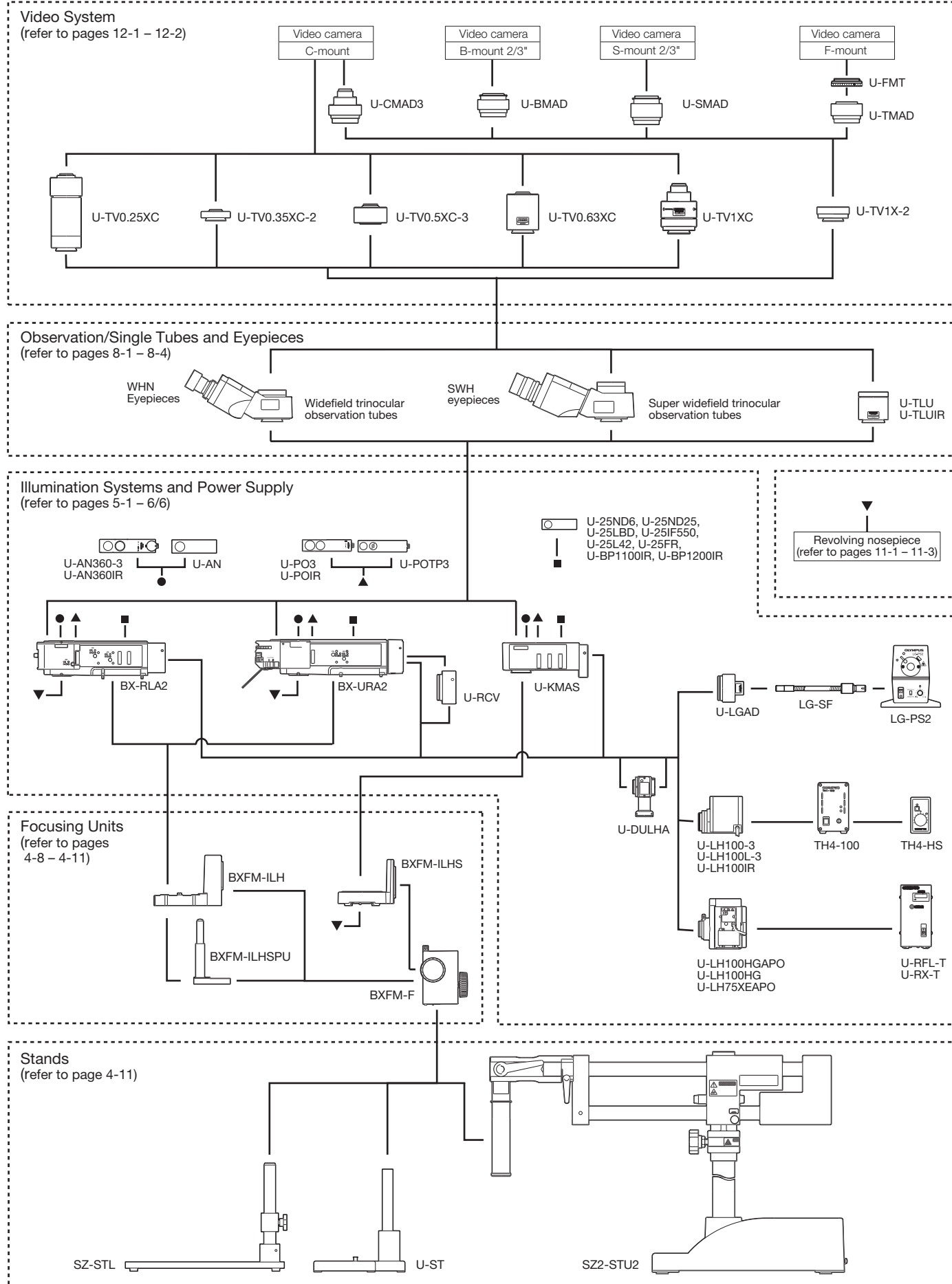
BX3 Series Basic Motorized System Diagram



*Please refer to "Section 13 Motorized Unit" for each motorized unit in the detail.

**Please consult your nearest Olympus representative for details about motorized system configurations and combinations.

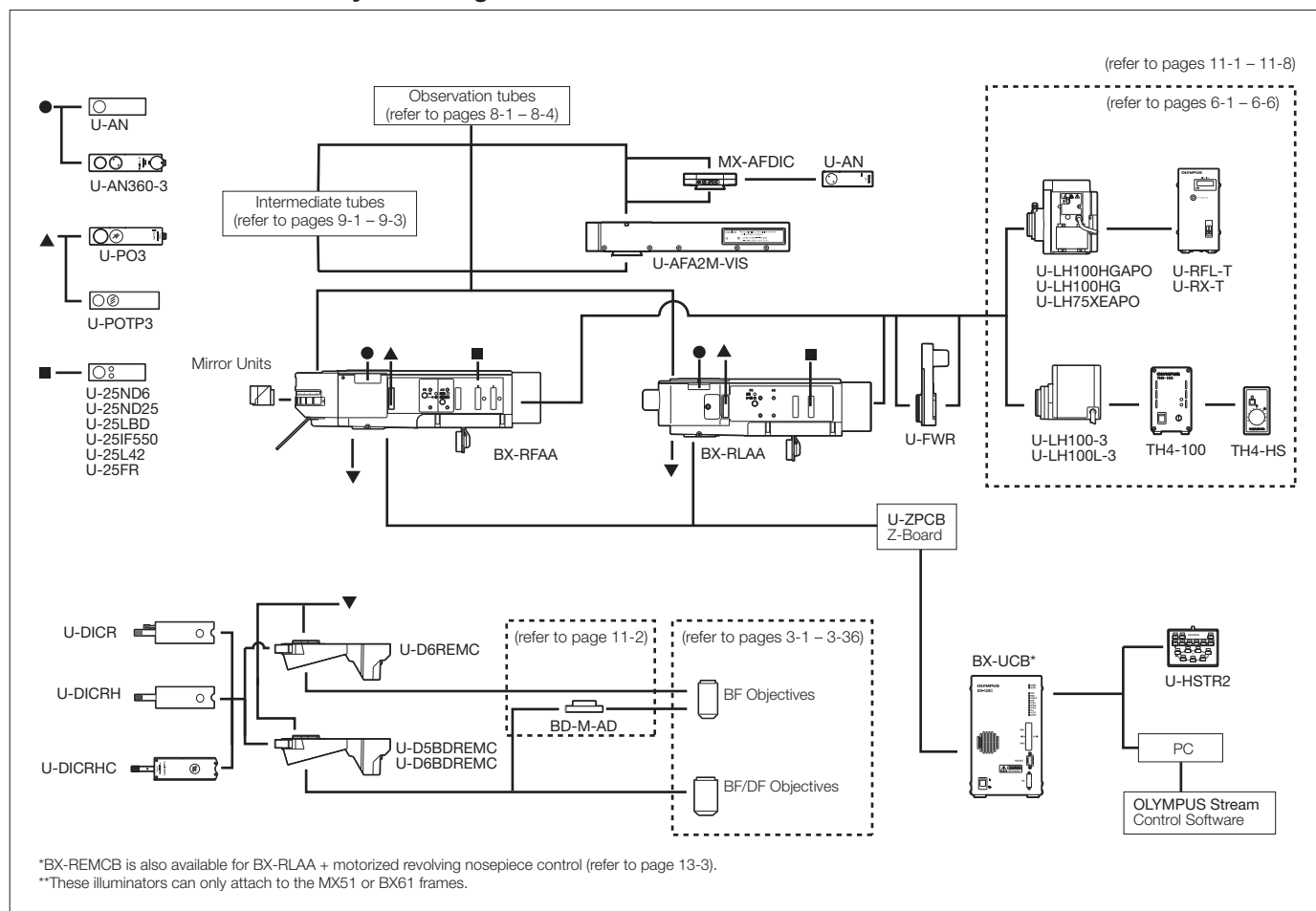
BX2 Series BAXM System Diagram



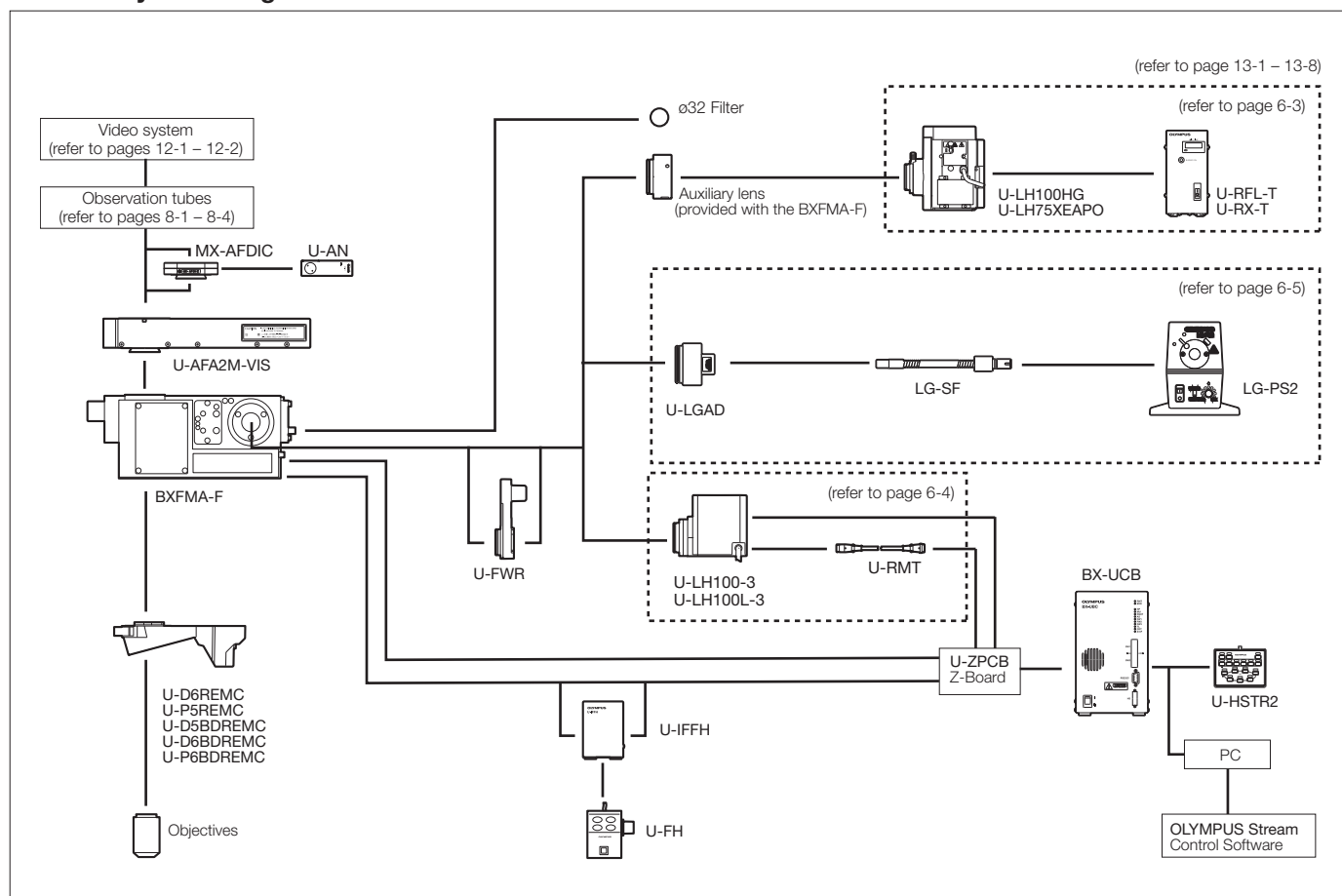
*Different types may be offered in each area.

System Diagram

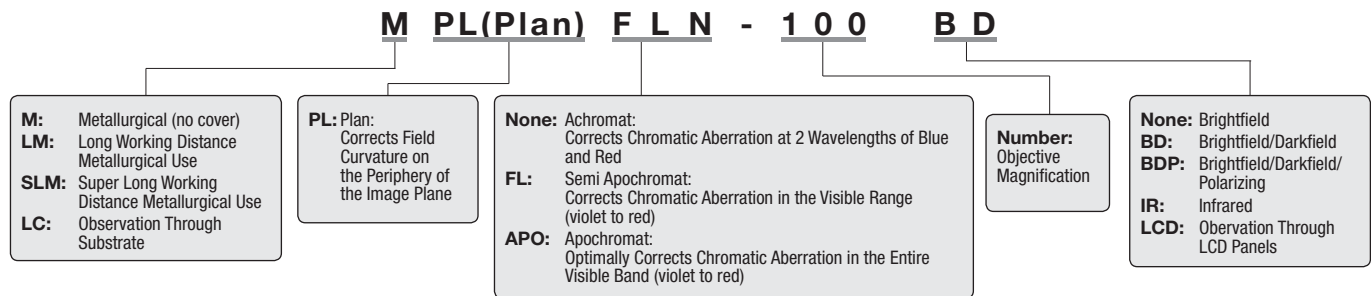
BX2 Series Motorized Unit System Diagram



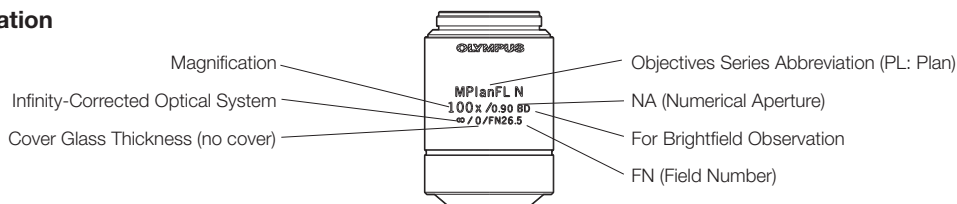
BXFM-A System Diagram



Definition for Objective Abbreviations



Objective Notation



Objective Series List

Series	Magnification	BF	DF	DIC*1	POL	FL	FN	Remarks
MPLAPON	50/100	○		○ U	○		26.5	
MPLAPON O	100	○					26.5	
MPLFLN	1.25/2.5	○					1.25X: 22/2.5X: 26.5	We recommend using a polarizer and analyzer
	5/10/20/40**/50/100	○		○ U	○	○*3	26.5	
LMPLFLN	5/10/20/50/100	○		○ L	○	○	26.5	
MPLN	5/10/20/50/100	○					22	
LCPLFLN-LCD	20/50/100	○		○ L			26.5	For LCD
SLMPLN	20/50/100	○					26.5	
LMPLN-IR	5/10	○					22	For near-IR observation
LCPLN-IR	20/50/100	○					22	For near-IR observation
MPLFLN-BD	5/10/20/50/100/150	○	○	○ U	○	○*3	26.5	
MPLFLN-BDP	5/10/20/50/100	○	○	○ U	○	○*3	26.5	
LMPLFLN-BD	5/10/20/50/100	○	○	○ L	○	○	26.5	
MPLN-BD	5/10/20/50/100	○	○				22	
WL100XMRTC	100X						22	Mirau objective

*1 DIC Prism U-DICR: UM/LM Position, U-DICRH: LM Position Fixed, U-DICRH: UM Position Fixed. *2 40X: BF Only *3 5–20X: U Excitation Also Possible.
○: Responds; ◎: Optimally Responds; BF: Brightfield; DF: Darkfield; DIC: Differential Interference Contrast; POL: Polarized light; FL: Fluorescence

Features of Each Objective Series

● MPLAPON series: M Plan Apochromat — p. 3-2

This series of Plan Apochromat objectives corrects chromatic aberrations at optimal levels. Olympus guarantees* the optical performance (correction for wavefront aberration) with a Strehl ratio** of 95% or better. These objectives can be used with Olympus' U-AFA2M active auto focus unit.

● MPLAPON100XO: M Plan Apochromat — p. 3-2

This Plan Apochromat objective is designed for oil immersion*** and features a numerical aperture of 1.4. The objective provides excellent chromatic aberration correction and high resolving power.

● MPLFLN series: M Plan Semi Apochromat — p. 3-3

This series of Plan Semi Apochromat objectives delivers high-level correction for chromatic aberration. The eight objectives in this series offer magnifications ranging from 1.25X to 100X and a minimum working distance of 1 mm (except 40X). Since the exit pupil position of the 5X–100X objectives is standardized, the position of the DIC prism does not have to be switched when changing the magnification (40X is not applicable to DIC observation). For very low magnifications (1.25X, 2.5X), use the objectives with an analyzer, polarizer, and reflected light illuminator.

● LMPLFLN series: Long Working Distance M Plan Semi Apochromat — p. 3-4

This series of long working distance Plan Semi Apochromat objectives delivers high-level correction for chromatic aberration. Because of the long working distance, these objectives are suitable for observing larger samples. Since the exit pupil position of the 5X–100X objectives is standardized, the position of the DIC prism does not have to be switched when changing the magnification.

● MPLN series: M Plan Achromat — p. 3-5

Plan Achromat objectives provide excellent image flatness up to FN 22.

● LCPLFLN-LCD series: LCD Long Working Distance M Plan Semi Apochromat — p. 3-6

These objectives are designed for making observations through LCD panels and other samples that have a glass substrate. The correction collar provides aberration correction that can be matched to the thickness of the glass.

● SLMPLN series: Super Long Working Distance M Plan Achromat — p. 3-7

These are high-magnification Plan Achromat objectives with a super long working distance. Three magnifications, 20X, 50X, and 100X, are available. For 5X or 10X objectives, select from the LMPLFLN series.

● LMPLN-IR series: IR Long Working Distance M Plan Achromat — p. 3-8

This series is designed for near-infrared microscopy, which is typically used to view the internal structure of silicon wafers.

● LCPLN-IR series: IR Long Working Distance M Plan Achromat — p. 3-9

This series is designed for near-infrared microscopy, which is typically used to view the internal structure of silicon wafers. These objectives have a correction collar to correct for aberrations based on the thickness of the silicon or glass substrate.

● MPLFLN-BD series: M Plan Semi Apochromat BD — p. 3-10

This series of Plan Semi Apochromat objectives provides high-level correction for chromatic aberration with a minimum working distance of 1 mm. Since the exit pupil position of the 5X–100X objectives is standardized, the position of the DIC prism does not have to be switched when changing the magnification.

● MPLFLN-BDP series: M Plan Semi Apochromat BDP — p. 3-11

This series of Plan Semi Apochromat objectives provides high-level correction for chromatic aberrations with a minimum working distance of 1 mm. Since the exit pupil position of the 5X–100X objectives is standardized, the position of the DIC prism does not have to be switched when changing the magnification. This series is optimized for brightfield, darkfield, and polarized light observations and can be used with differential interference contrast.

● LMPLFLN-BD series: Long Working Distance M Plan Semi Apochromat BD — p. 3-12

This series of long working distance Plan Semi Apochromat objectives provides high-level correction for chromatic aberration and are suitable for observing samples with height or varying topography. Since the exit pupil position of the 5X–100X objectives is standardized, the position of the DIC prism does not have to be switched when changing the magnification.

● MPLN-BD series: M Plan Achromat BD — p. 3-13

This series of Plan Achromat objectives provides excellent image flatness up to FN 22.

● WL100XMRTC series: White Light Interferometry Objective — p. 3-14

This objective is designed to be used with Mirau-style white light interferometers and tolerates high temperatures. The objective has a working distance of 0.7 mm and an optimized NA of 0.8 that provides improved light gathering.

*Measurement guarantee assessed with an Olympus interferometer for transmitted wavefront measurement under the following conditions: a temperature of 23 °C ± 1 °C; measurements made within the 97% range of the pupil diameter.

**Strehl ratio: Indicates in percent (%) the ratio of the proportion of light that an actual optical system can concentrate with respect to the proportion of light concentrated in the image plane (central intensity) by an ideal, aberration-free optical system, with the latter serving as 100%. A higher percentage indicates a higher quality optical system.

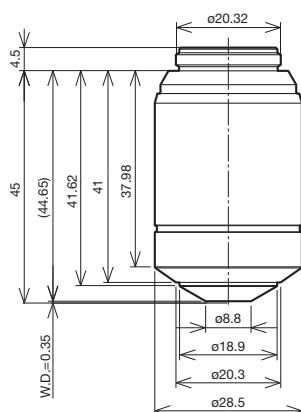
***Specified oil: IMMOIL-F30CC

M Plan Apochromat

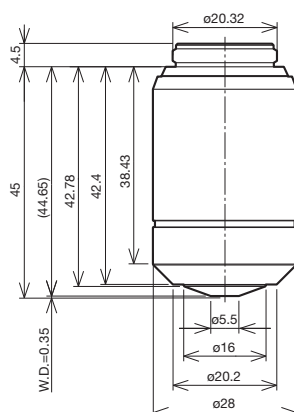
MPLAPON series

This series of Plan Apochromat objectives corrects chromatic aberrations at optimal levels. Olympus guarantees* the optical performance (correction for wavefront aberration) with a Strehl ratio** of 95% or better. These objectives can be used with Olympus' U-AFA2M active auto focus unit.

MPLAPON50X



MPLAPON100X



* Measurement guarantee assessed with an Olympus interferometer for transmitted wavefront measurement under the following conditions: a temperature of 23 °C + 1 °C; measurements made within the 97% range of the pupil diameter.

** Strehl ratio: Indicates in percent (%) the ratio of the proportion of light that an actual optical system can concentrate with respect to the proportion of light concentrated in the image plane (central intensity) by an ideal, aberration-free optical system, with the latter serving as 100%. A higher percentage indicates a higher quality optical system.

Unit: mm

UIS2 Objectives					Widefield Eyepiece WHN10X FN 22			Super Widefield Eyepiece SWH10X FN 26.5		
Objective (magnification)	NA	W.D. (mm)	Focal Distance f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Focus (μm)	Total Magnification	Practical Field of View (mm)	Depth of Focus (μm)
MPLAPON50X	0.95	0.35	3.6	139	500	0.44	1	500	0.53	1
MPLAPON100X	0.95	0.35	1.8	125	1000	0.22	0.67	1000	0.27	0.7

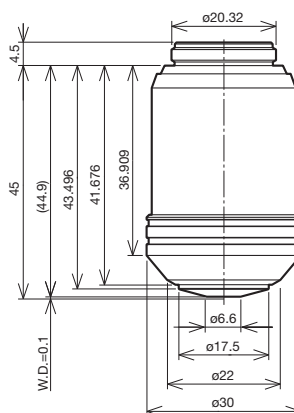
Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

M Plan Apochromat

MPLAPON100XO

This Plan Apochromat objective is designed for oil immersion*** and features a numerical aperture of 1.4. The objective provides excellent chromatic aberration correction and high resolving power.

MPLAPON100XO



*** Specified Oil: IMMOIL-F30CC

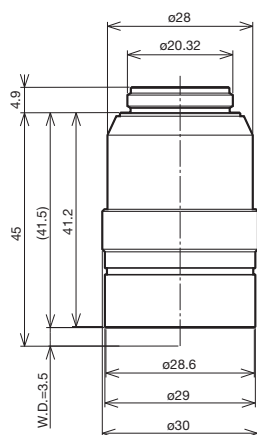
Unit: mm

UIS2 Objectives					Widefield Eyepiece WHN10X FN 22			Super Widefield Eyepiece SWH10X FN 26.5		
Objective (magnification)	NA	W.D. (mm)	Focal Distance f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Focus (μm)	Total Magnification	Practical Field of View (mm)	Depth of Focus (μm)
MPLAPON100XO	1.4	0.1	1.8	158	1000	0.22	0.59	1000	0.27	0.59

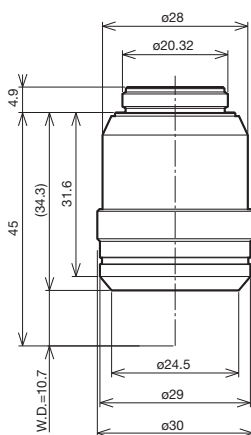
Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

This series of Plan Semi Apochromat objectives delivers high-level correction for chromatic aberration. The eight objectives in this series offer magnifications ranging from 1.25X to 100X and a minimum working distance of 1 mm (except 40X). Since the exit pupil position of the 5X–100X objectives is standardized, the position of the DIC prism does not have to be switched when changing the magnification (40X is not applicable to DIC observation). For very low magnifications (1.25X, 2.5X), use the objectives with an analyzer, polarizer, and reflected light illuminator.

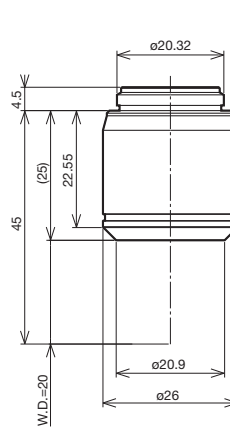
MPLFLN1.25X



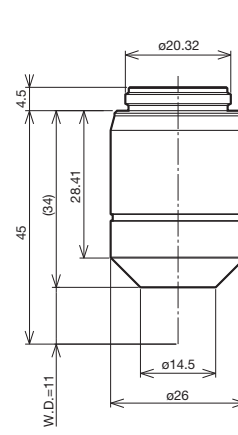
MPLFLN2.5X



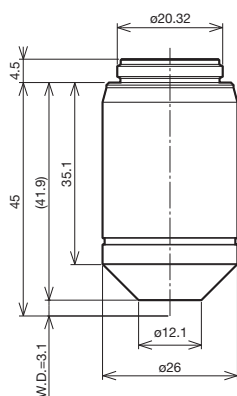
MPLFLN5X



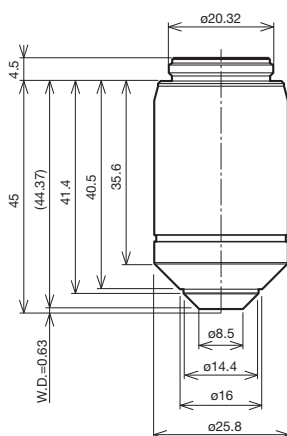
MPLFLN10X



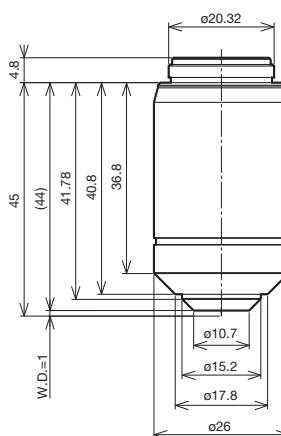
MPLFLN20X



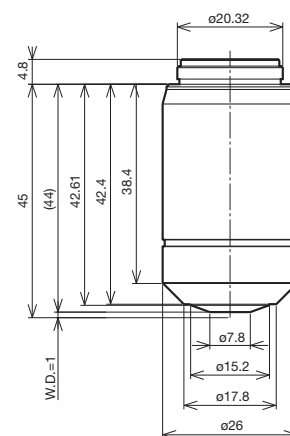
MPLFLN40X



MPLFLN50X



MPLFLN100X



Unit: mm

UIS2 Objectives					Widefield Eyepiece WHN10X FN 22			Super Widefield Eyepiece SWH10X FN 26.5		
Objective (magnification)	NA	W.D. (mm)	Focal Distance f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Focus (μm)	Total Magnification	Practical Field of View (mm)	Depth of Focus (μm)
MPLFLN1.25X	0.04	3.5	145	122	12.5	17.6	870	—	—	—
MPLFLN2.5X	0.08	10.7	72	106	25	8.8	220	25	10.6	220
MPLFLN5X	0.15	20	36	51.5	50	4.4	59	50	5.3	59
MPLFLN10X	0.3	11	18	68.1	100	2.2	15	100	2.7	15
MPLFLN20X	0.45	3.1	9	70.4	200	1.1	5.2	200	1.3	5.1
MPLFLN40X	0.75	0.63	4.5	120	400	0.55	1.66	400	0.66	1.66
MPLFLN50X	0.8	1	3.6	89.9	500	0.44	1.3	500	0.53	1.3
MPLFLN100X	0.9	1	1.8	90.9	1000	0.22	0.73	1000	0.27	0.73

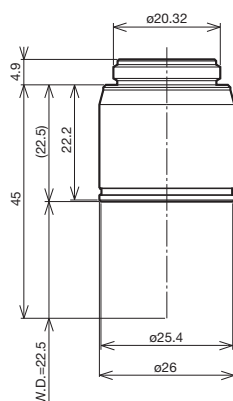
Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

Long Working Distance M Plan Semi Apochromat

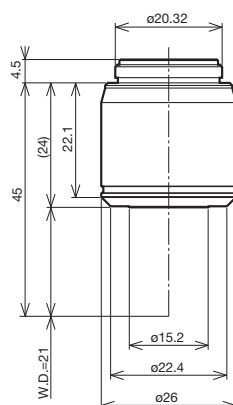
LMPLFLN series

This series of long working distance Plan Semi Apochromat objectives delivers high-level correction for chromatic aberration. Because of the long working distance, these objectives are suitable for observing larger samples. Since the exit pupil position of the 5X–100X objectives is standardized, the position of the DIC prism does not have to be switched when changing the magnification.

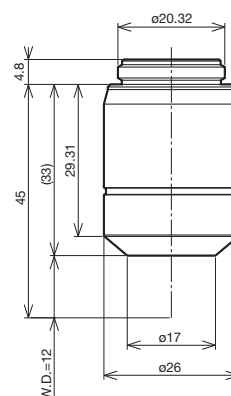
LMPLFLN5X



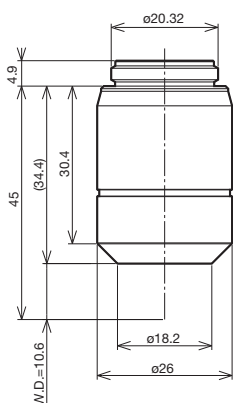
LMPLFLN10X



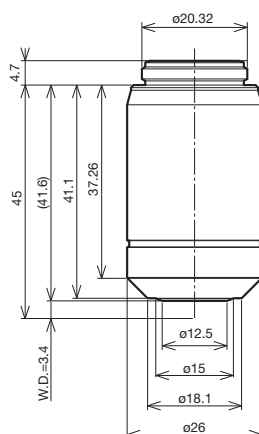
LMPLFLN20X



LMPLFLN50X



LMPLFLN100X



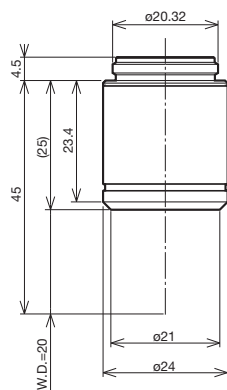
Unit: mm

UIS2 Objectives					Widefield Eyepiece WHN10X FN 22			Super Widefield Eyepiece SWH10X FN 26.5		
Objective (magnification)	NA	W.D. (mm)	Focal Distance f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Focus (μm)	Total Magnification	Practical Field of View (mm)	Depth of Focus (μm)
LMPLFLN5X	0.13	22.5	36	50	50	4.4	70	50	5.3	70
LMPLFLN10X	0.25	21	18	54	100	2.2	18	100	2.7	18
LMPLFLN20X	0.4	12	9	73	200	1.1	6.1	200	1.3	6.1
LMPLFLN50X	0.5	10.6	3.6	77	500	0.44	2.5	500	0.53	2.5
LMPLFLN100X	0.8	3.4	1.8	94	1000	0.22	0.87	1000	0.27	0.87

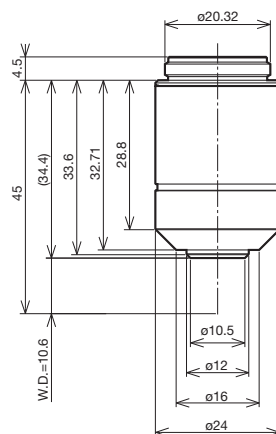
Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

Plan Achromat objectives provide excellent image flatness up to FN 22.

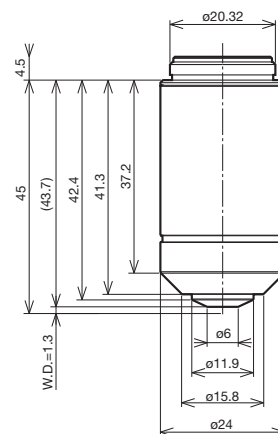
MPLN5X



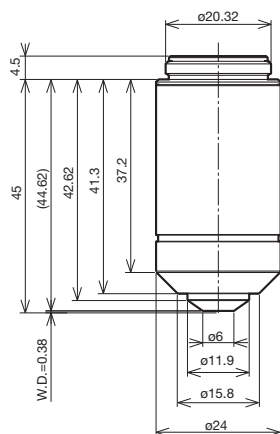
MPLN10X



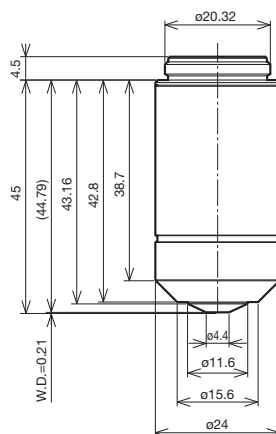
MPLN20X



MPLN50X



MPLN100X



Unit: mm

UIS2 Objectives					Widefield Eyepiece WHN10X FN 22		
Objective (magnification)	NA	W.D. (mm)	Focal Distance f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Focus (μm)
MPLN5X	0.1	20	36	64	50	4.4	98
MPLN10X	0.25	10.6	18	80	100	2.2	18
MPLN20X	0.4	1.3	9	111	200	1.1	6.1
MPLN50X	0.75	0.38	3.6	13	500	0.44	1.4
MPLN100X	0.9	0.21	1.8	116	1000	0.22	0.73

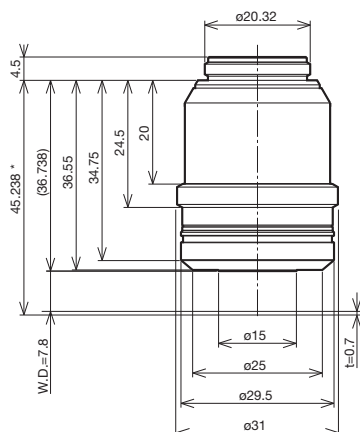
Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

LCD Long Working Distance M Plan Semi Apochromat

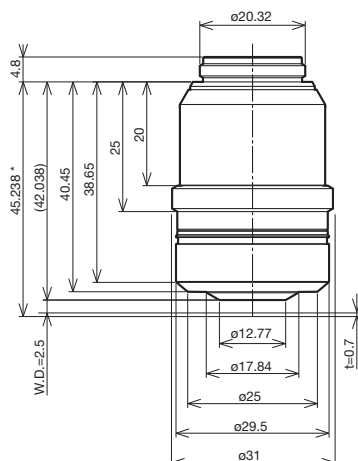
LCPLFLN-LCD series

These objectives are designed for making observations through LCD panels and other samples that have a glass substrate. The correction collar provides aberration correction that can be matched to the thickness of the glass.

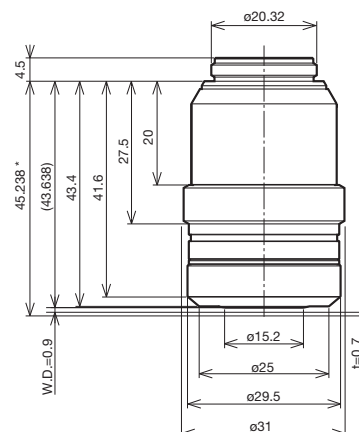
LCPLFLN20XLCD



LCPLFLN50XLCD



LCPLFLN100XLCD



*Typical value when cover glass thickness is 0.7 mm.

Unit: mm

Objective	LCPLFLN20XLCD			LCPLFLN50XLCD			LCPLFLN100XLCD		
Corresponding Glass Thickness (mm)	0-1.2			0-1.2			0-0.7		
Correction Collar Indication	0	0.7	1.2	0	0.7	1.2	0	0.5	0.7
W.D. (mm)	8.3	7.8	7.4	3	2.5	2.2	1.2	0.98	0.9
Correction System	Correction Collar			Correction Collar			Correction Collar		

UIS2 Objectives					Widefield Eyepiece WHN10X FN 22			Super Widefield Eyepiece SWH10X FN 26.5		
Objective (magnification)	NA	W.D.** (mm)	Focal Distance f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Focus (μm)	Total Magnification	Practical Field of View (mm)	Depth of Focus (μm)
LCPLFLN20XLCD	0.45	7.8	9	146	200	1.1	5.2	200	1.3	5.2
LCPLFLN50XLCD	0.7	2.5	3.6	170	500	0.44	1.6	500	0.53	1.6
LCPLFLN100XLCD	0.85	0.9	1.8	185	1000	0.22	0.79	1000	0.27	0.79

Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

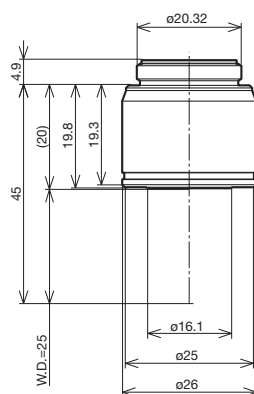
**Value when the correction collar indication is 0.7.

Super Long Working Distance M Plan Achromat

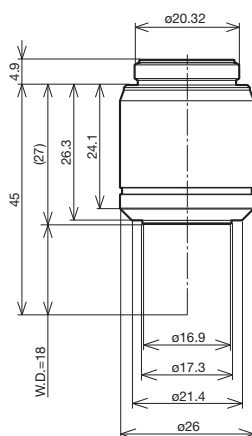
SLMPLN series

These are high-magnification Plan Achromat objectives with a super long working distance. Three magnifications, 20X, 50X, and 100X, are available. For 5X or 10X objectives, select from the LMPLFLN series.

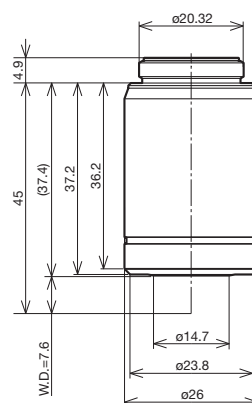
SLMPLN20X



SLMPLN50X



SLMPLN100X



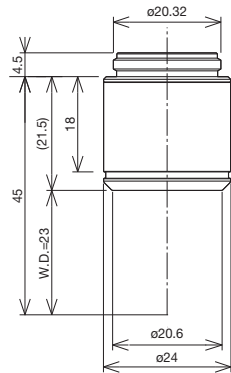
Unit: mm

UIS2 Objectives					Widefield Eyepiece WHN10X FN 22			Super Widefield Eyepiece SWH10X FN 26.5		
Objective (magnification)	NA	W.D. (mm)	Focal Distance f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Focus (μm)	Total Magnification	Practical Field of View (mm)	Depth of Focus (μm)
SLMPLN20X	0.25	25	9	56	200	1.1	11.4	200	1.3	11.4
SLMPLN50X	0.35	18	3.6	74	500	0.44	4.2	500	0.53	4.2
SLMPLN100X	0.6	7.6	1.8	100	1000	0.22	1.3	1000	0.27	1.3

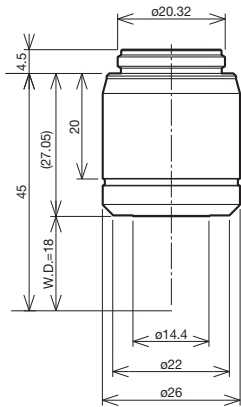
Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

This series is designed for near-infrared microscopy, which is typically used to view the internal structure of silicon wafers.

LMPLN5XIR



LMPLN10XIR



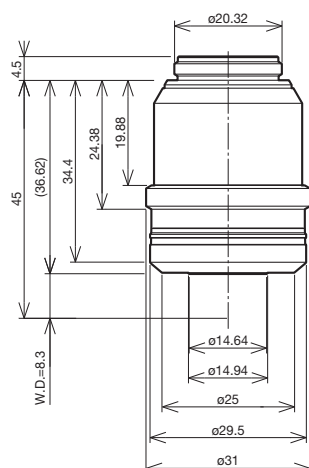
Unit: mm

UIS2 Objectives				
Objective (magnification)	NA	W.D. (mm)	Focal Distance f (mm)	Weight (g)
LMPLN5XIR	0.1	23	36	55
LMPLN10XIR	0.3	18	18	78

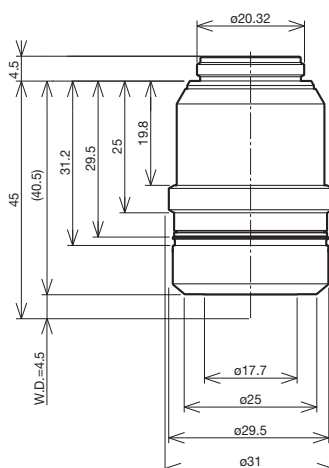
Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

This series is designed for near-infrared microscopy, which is typically used to view the internal structure of silicon wafers. These objectives have a correction collar to correct for aberrations based on the thickness of the silicon or glass substrate.

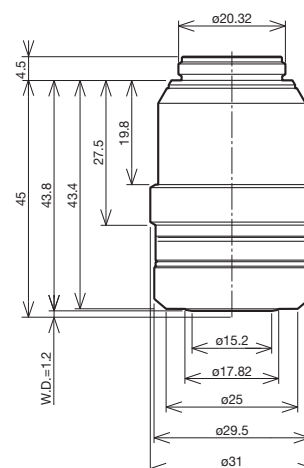
LCPLN20XIR



LCPLN50XIR



LCPLN100XIR



Unit: mm

Silicon thickness correction

Objective	LCPLN20XIR			LCPLN50XIR			LCPLN100XIR		
Corresponding Silicon Thickness (mm)	0-1.2			0-1.2			0-1.0		
Correction Collar Indication	0	0.7	1.2	0	0.6	1.2	0	0.5	1
W.D.* (mm)	8.3	8.2	8	4.5	4.3	4.1	1.2	1.1	1
Correction System	Correction Collar			Correction Collar			Correction Collar		

*Using a 1100 nm laser.

Silicon thickness correction

Objective	LCPLN20XLCD			LCPLN50XLCD		LCPLN100XLCD	
Corresponding Glass Thickness (mm)	0-1.2			0-1.2		0-0.7	
Correction Collar Indication	0	0.7	1.2	0	1.2	0	0.7
W.D.* (mm)	8.3	7.9	7.6	4.5	3.7	1.2	0.9
Correction System	Correction Collar			Correction Collar		Correction Collar	

*Using a 1064 nm laser.

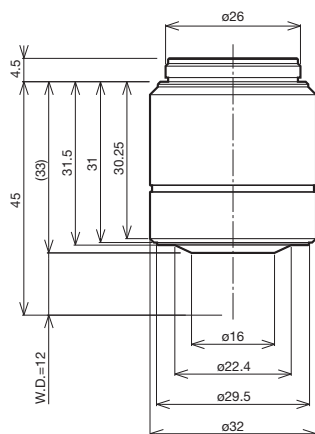
UIS2 Objectives				
Objective (magnification)	NA*	W.D.* (mm)	Focal Distance f (mm)	Weight (g)
LCPLN20XIR	0.45	8.3	9	149
LCPLN50XIR	0.65	4.5	3.6	169
LCPLN100XIR	0.85	1.2	1.8	184

Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

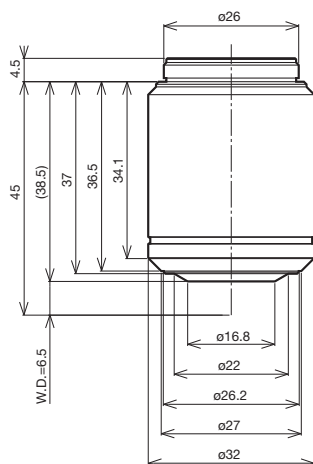
*Value when the correction collar indication is 0.

This series of Plan Semi Apochromat objectives provides high-level correction for chromatic aberration with a minimum working distance of 1 mm. Since the exit pupil position of the 5X–150X objectives is standardized, the position of the DIC prism does not have to be switched when changing the magnification.

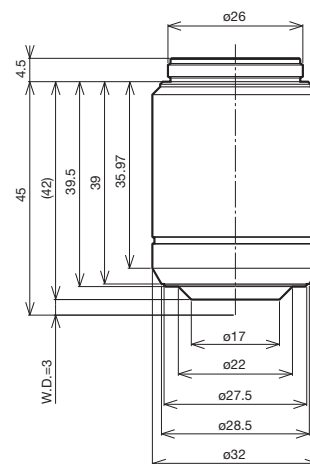
MPLFLN5XBD



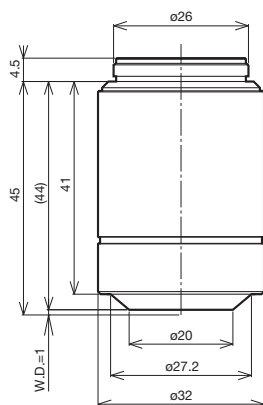
MPLFLN10XBD



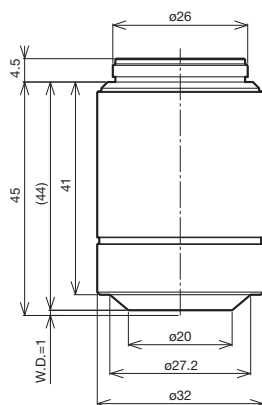
MPLFLN20XBD



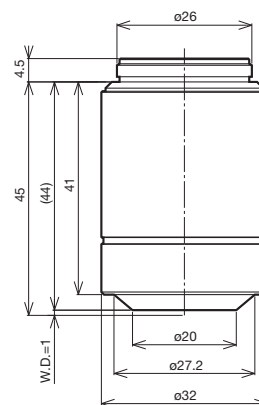
MPLFLN50XBD



MPLFLN100XBD



MPLFLN150XBD



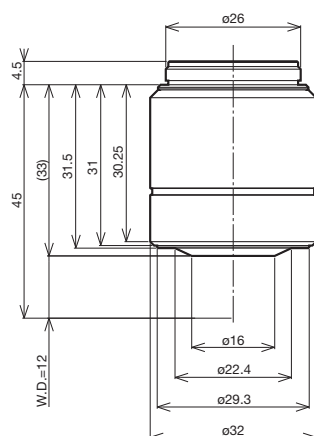
Unit: mm

UIS2 Objectives					Widefield Eyepiece WHN10X FN 22			Super Widefield Eyepiece SWH10X FN 26.5		
Objective (magnification)	NA	W.D. (mm)	Focal Distance f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Focus (μ m)	Total Magnification	Practical Field of View (mm)	Depth of Focus (μ m)
MPLFLN5XBD	0.15	12	36	95.5	50	4.4	59	50	5.3	59
MPLFLN10XBD	0.3	6.5	18	82.8	100	2.2	15	100	2.7	15
MPLFLN20XBD	0.45	3	9	87.7	200	1.1	5.2	200	1.3	5.2
MPLFLN50XBD	0.8	1	3.6	99.8	500	0.44	1.3	500	0.53	1.3
MPLFLN100XBD	0.9	1	1.8	98.9	1000	0.22	0.73	1000	0.27	0.73
MPLFLN150XBD	0.9	1	1.2	104.8	1500	0.15	0.6	1500	0.18	0.6

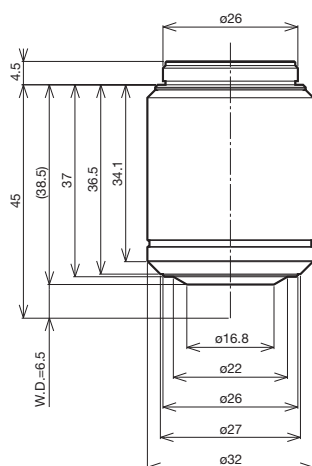
Screw: W 26 mm $\times$ 0.706 mm (1 in. $\times$ 0.03 in.)

This series of Plan Semi Apochromat objectives provides high-level correction for chromatic aberrations with a minimum working distance of 1 mm. Since the exit pupil position of the 5X–100X objectives is standardized, the position of the DIC prism does not have to be switched when changing the magnification. This series is optimized for brightfield, darkfield, and polarized light observations and can be used with differential interference contrast.

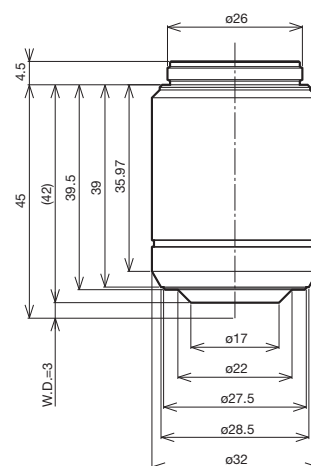
MPLFLN5XBDP



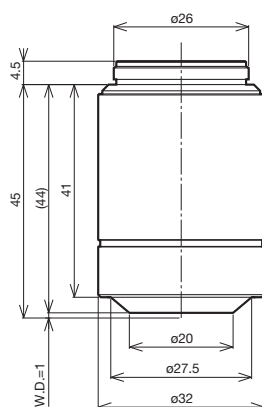
MPLFLN10XBDP



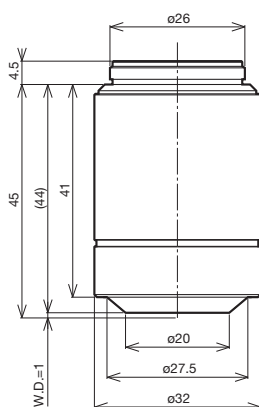
MPLFLN20XBDP



MPLFLN50XBDP



MPLFLN100XBDP



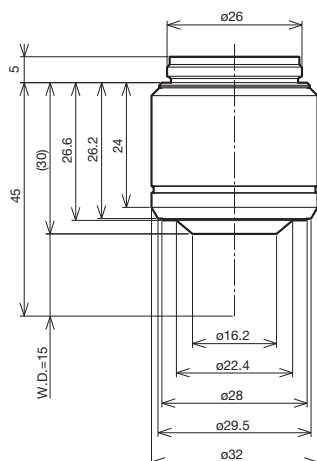
Unit: mm

UIS2 Objectives					Widefield Eyepiece WHN10X FN 22			Super Widefield Eyepiece SWH10X FN 26.5		
Objective (magnification)	NA	W.D. (mm)	Focal Distance f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Focus (μm)	Total Magnification	Practical Field of View (mm)	Depth of Focus (μm)
MPLFLN5XBDP	0.15	12	36	95.5	50	4.4	59	50	5.3	59
MPLFLN10XBDP	0.25	6.5	18	83.3	100	2.2	18	100	2.7	18
MPLFLN20XBDP	0.4	3	9	88.5	200	1.1	6.1	200	1.3	6.1
MPLFLN50XBDP	0.75	1	3.6	100.5	500	0.44	1.4	500	0.53	1.4
MPLFLN100XBDP	0.9	1	1.8	101.5	1000	0.22	0.73	1000	0.27	0.73

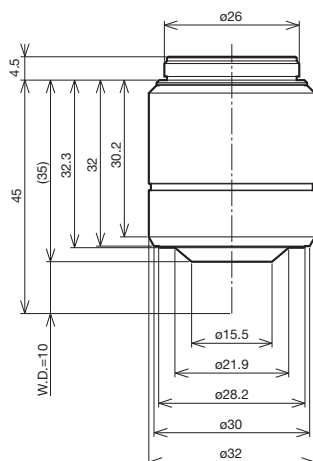
Screw: W 26 mm × 0.706 mm (1 in. × 0.03 in.)

This series of long working distance Plan Semi Apochromat objectives provides high-level correction for chromatic aberration and are suitable for observing larger samples. Since the exit pupil position of the 5X–100X objectives is standardized, the position of the DIC prism does not have to be switched when changing the magnification.

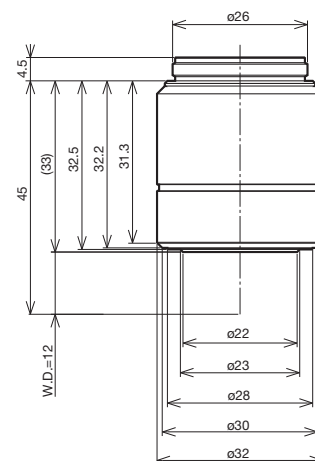
LMPLFLN5XBD



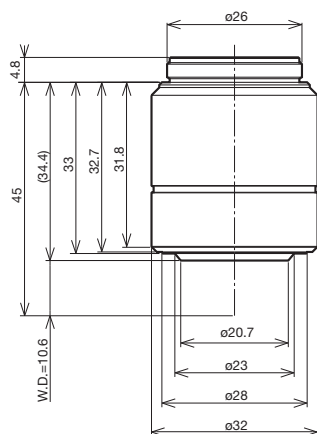
LMPLFLN10XBD



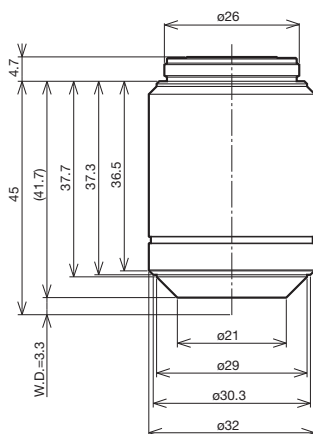
LMPLFLN20XBD



LMPLFLN50XBD



LMPLFLN100XBD



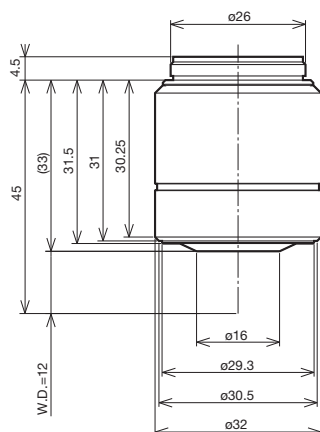
Unit: mm

UIS2 Objectives					Widefield Eyepiece WHN10X FN 22			Super Widefield Eyepiece SWH10X FN 26.5		
Objective (magnification)	NA	W.D. (mm)	Focal Distance f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Focus (μm)	Total Magnification	Practical Field of View (mm)	Depth of Focus (μm)
LMPLFLN5XBD	0.13	15	36	81	50	4.4	70	50	5.3	70
LMPLFLN10XBD	0.25	10	18	84	100	2.2	18	100	2.7	18
LMPLFLN20XBD	0.4	12	9	86	200	1.1	6.1	200	1.3	6.1
LMPLFLN50XBD	0.5	10.6	3.6	85	500	0.44	2.5	500	0.53	2.5
LMPLFLN100XBD	0.8	3.3	1.8	102	1000	0.22	0.87	1000	0.27	0.87

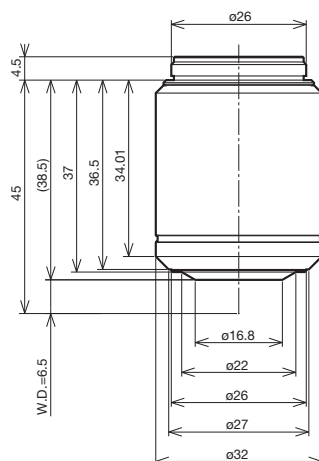
Screw: W 26 mm × 0.706 mm (1 in. × 0.03 in.)

This series of Plan Achromat objectives provides excellent image flatness up to FN 22.

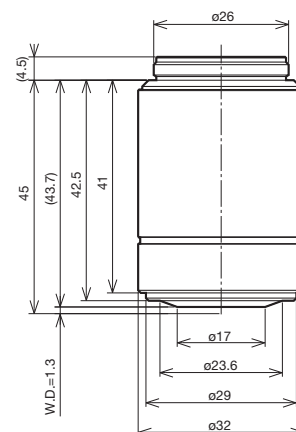
MPLN5XBD



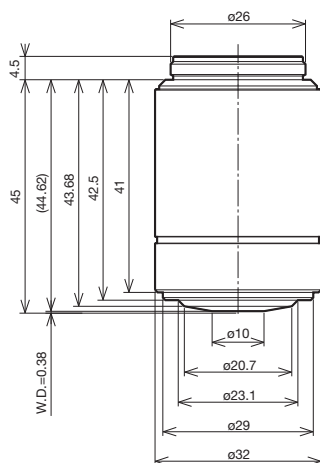
MPLN10XBD



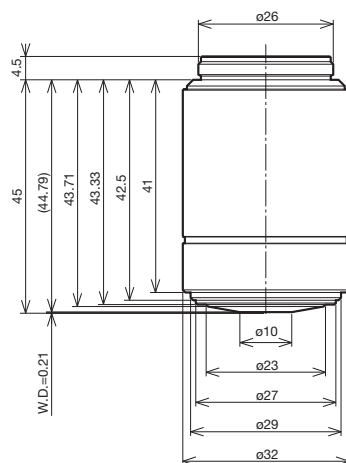
MPLN20XBD



MPLN50XBD



MPLN100XBD



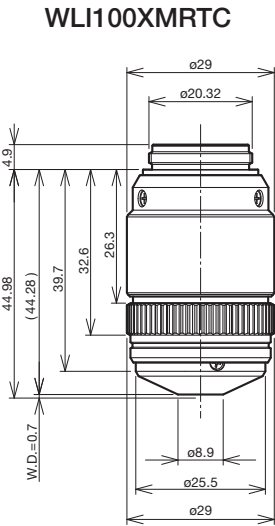
Unit: mm

UIS2 Objectives					Widefield Eyepiece WHN10X FN 22		
Objective (magnification)	NA	W.D. (mm)	Focal Distance f (mm)	Weight (g)	Total Magnifications	Practical Field of View (mm)	Depth of Focus (μm)
MPLN5XBD	0.1	12	36	137	50	4.4	98
MPLN10XBD	0.25	6.5	18	155	100	2.2	18
MPLN20XBD	0.4	1.3	9	162	200	1.1	6.1
MPLN50XBD	0.75	0.38	3.6	157	500	0.44	1.4
MPLN100XBD	0.9	0.21	1.8	160	1000	0.22	0.73

Screw: W 26 mm × 0.706 mm (1 in. × 0.03 in.)

White Light Interferometry Objective
WLI100XMRTC

This objective is designed to be used with Mirau-style white light interferometers and tolerates high temperatures. The objective has a working distance of 0.7 mm and an optimized NA of 0.8 that provides improved light gathering.

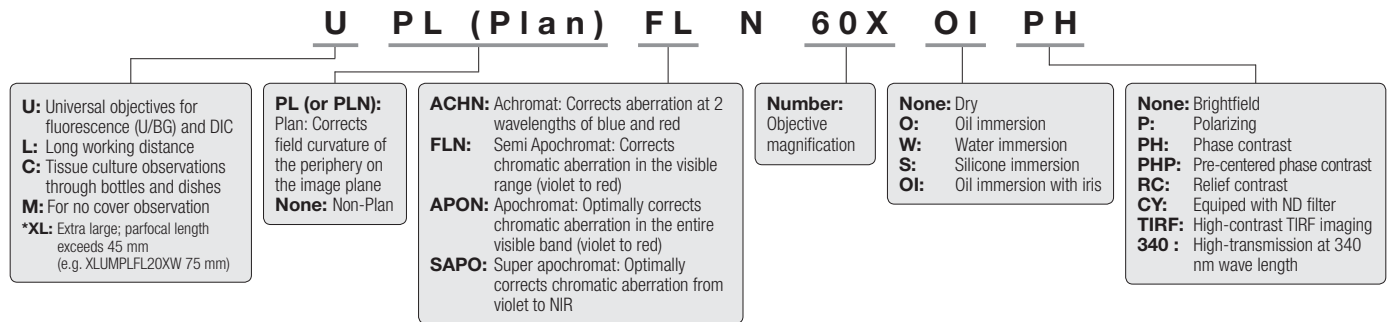


unit: mm

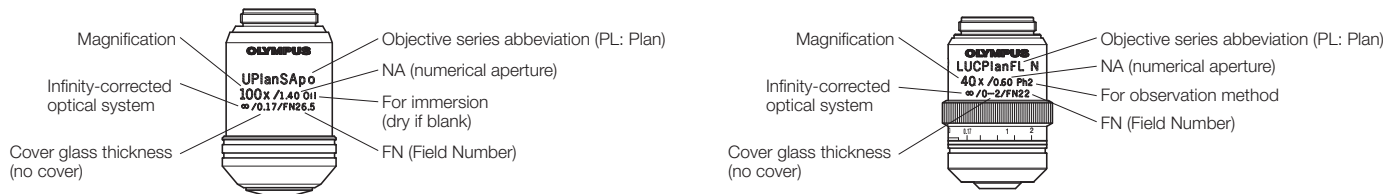
Objective (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
WLI100XMRTC	0.8	0.7	0	—	—	—	22.0

Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

■ Definition for Objective Abbreviations



■ Objective Notation



■ Objective series List

Objective series for standard biological samples

Series	Magnification	BF	DF	DIC*	POL	FL	FN	Remarks
UPLSAPO	4X/10X/20X/20XO/40X/60XO/60XW/100XO	○	10X/20X/20XO	○ (except 4X)	○	○	26.5	
PLAPON	1.25X/2X/60XO	○		60XO	60XO	60XO	26.5	
UPLFLN	4X/10X/20X/40X/40XO/60X/60XOI/100XO/100XOI	○	10X/20X/40X/60XOI/100XOI	○ (except 4X)	○	○	26.5	
PLFLN	100X	○				○	26.5	
PLN	2X/4X/10X/20X/40X/50XOI/100XO	○	10X/20X/40X/50XOI	10X/20X/40X/50XOI		○	22	
UPLFLN-PH	4XPH/10XPH/20XPH/40XPH/60XOIPH/100XOPH	○	10XPH/20XPH/40XPH/60XOIPH			○	26.5	
PLN-PH	10XPH/20XPH/40XPH/100XOPH	○	○ (except 100XOPH)				22	
UPLFLN-P	4XP/10XP/20XP/40XP/100XOP	○	10XP/20XP/40XP	○ (except 4XP)	○	○	26.5	
PLN-P/ACHN-P	4XP/10XP/20XP/40XP/100XOP	○	10XP/20XP/40XP		○	○	22	
PLN-CY	2XCX/4XCX/10XCX/20XCX/(FLN) 10XCX	○					22	PLFLN10XCX FN 26.5

*These objectives are suitable for standard biological samples embedded on a glass slide with a 0.17 mm cover slip and are mainly used with upright microscopes.

Objective series for cultured samples

Series	Magnification	BF	DF	DIC	POL	FL	FN	Remarks
LUCPLFLN	20X/40X/60X	○	○	○	○	○	22	
LUCPLFLN-RC/ UCPLFLN-RC	10XRC/20XRC/40XRC	○	○			○	22	
LUCPLFLN-PH/ UCPLFLN-PH	10XPH/20XPH/40XPH/60XPH	○	○			○	22	
CPLN-PH/ LCACHN-PH	10XPH/20XPH/40XPH	○	○				22	
CPLN-RC/ LCACHN-RC	10XRC/20XRC/40XRC	○	○				22	

These objectives are suitable for cultured tissue/cell observation in a dish, bottle, or micro plate and are mainly used with inverted microscopes.

Objective series for special applications

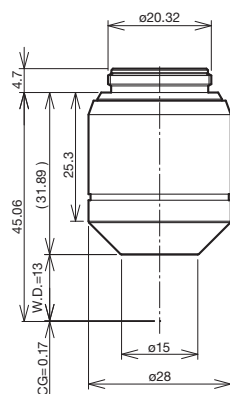
Series	Magnification	BF	DF	DIC	POL	FL	FN	Remarks
LUMPLFLN/ UMPLFLN	10XW/20XW/40XW/60XW	○	10XW/20XW	○	○	○	26.5	
XLUMPLFLN	20XW	○		○		○	22	Perofcal length 75 mm
APON 340	20XW/40XO/40XW	○	20XW/40XW	○	○	○	22	
TIRF Objectives	60XO/100XHO/100XO/150XO	○		○	○	○	22	

■ Features of Each Objective Series (please refer to the following pages for details on each objective.)

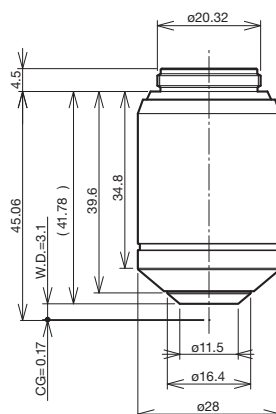
- UPLSAPO: Universal Plan Super Apochromat — p. 3-16
- PLAPON: Plan Apochromat — p. 3-18
- UPLFLN: Universal Plan Semi Apochromat/Plan Semi Apochromat — p. 3-19
- PLN: Plan Achromat — p. 3-21
- UPLFLN-PH UPlanFI-P Universal Plan Semi Apochromat for Phase Contrast — p. 3-23
- PLN-PH: Plan Achromat for Phase Contrast — p. 3-24
- UPLFLN-P: UPlanFI-P Universal Plan Semi Apochromat for Polarizing. — p. 3-25
- PLN/ACHN-P: Achromat for Polarizing. — p. 3-26
- PLN-CY: Plan Achromat (ND) — p. 3-27
- LUCPLFLN, UCPLFLN: Long Working Distance Universal Plan Semi Apochromat — p. 3-28
- LUCPLFLN/UCPLFLN-RC: Long Working Distance Universal Plan Semi Apochromat for Relief Contrast — p. 3-29
- LUCPLFLN/UCPLFLN-PH: Long Working Distance Universal Plan Semi Apochromat for Phase Contrast — p. 3-30
- CPLN/LCACHN-PH: Culture Specimen Objectives for Phase Contrast — p. 3-31
- CPLN/LCACHN-RC: Culture Specimen Objectives for Relief Contrast — p. 3-32
- LUMPLFLN/UMPLFLN: No Cover Water Immersion for Fixed Stage Upright Microscope — p. 3-33
- XLUMPLFLN: No Cover Water Immersion for Fixed Stage Upright Microscope — p. 3-34
- APON 340: Universal Apochromat — p. 3-35
- TIRF Objectives — p. 3-36

The UPLSAPO Super Apochromat objectives fully compensate for both spherical and chromatic aberrations from the UV to the near-infrared region. This enables the acquisition of sharp, clear images without color shift in brightfield, Nomarski DIC, and fluorescence observations. For quality and performance, this objective series is a splendid solution for numerous digital imaging applications.

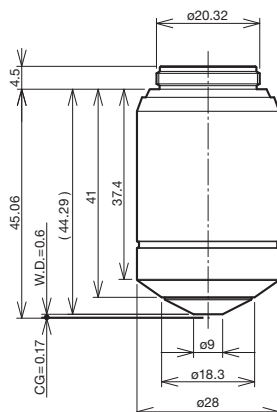
UPLSAPO4X



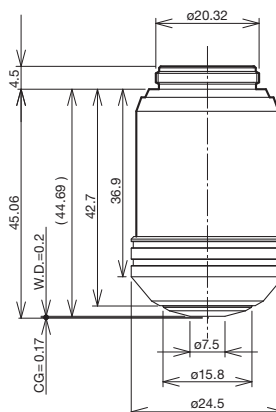
UPLSAPO10X2



UPLSAPO20X



UPLSAPO20XO



unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
UPLSAPO4X	0.16	13.0	—	—	—	U/BG/IR	26.5
UPLSAPO10X2	0.40	3.1	0.17	—	—	U/BG/IR	26.5
UPLSAPO20X	0.75	0.6	0.17	—	Yes	U/BG/IR	26.5
UPLSAPO20XO	0.85	0.2	—	Oil	Yes	U/BG/IR	26.5

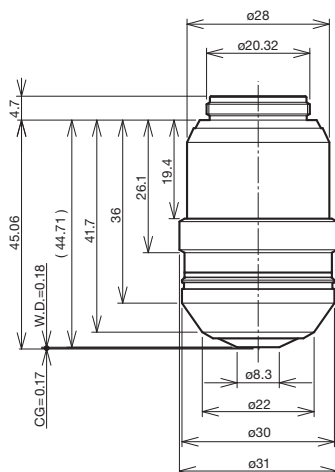
Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

*Defined with cover glass thickness shown as "CG" in the above drawings.

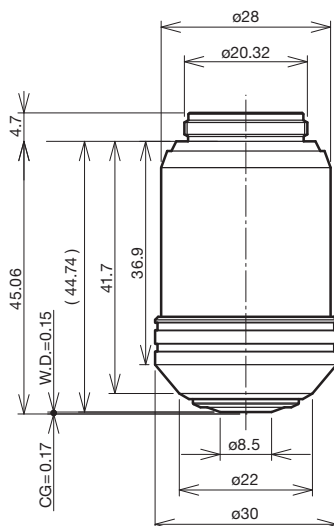
**U: UV Excitation, BG: Visible Excitation, IR: Near IR. "()" indicates that fluorescence might be slightly darker.

The UPLSAPO Super Apochromat objectives fully compensate for both spherical and chromatic aberrations from the UV to the near-infrared region. This enables the acquisition of sharp, clear images without color shift in brightfield, Nomarski DIC, and fluorescence observations. For quality and performance, this objective series is a splendid solution for numerous digital imaging applications.

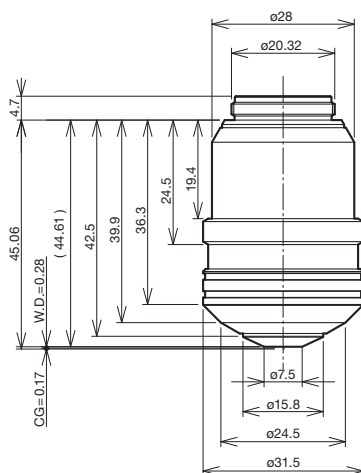
UPLSAPO40X2



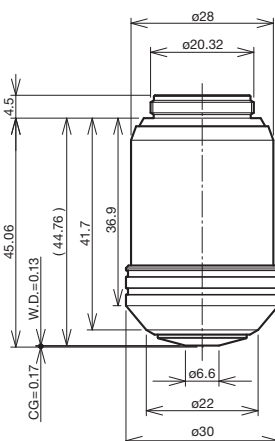
UPLSAPO60XO



UPLSAPO60XW



UPLSAPO100XO



unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
UPLSAPO40X2	0.95	0.18	0.11–0.23	—	Yes	U/BG/IR	26.5
UPLSAPO60XO	1.35	0.15	0.17	Oil	Yes	U/BG/IR	26.5
UPLSAPO60XW	1.20	0.28	0.13–0.21	Water	Yes	U/BG/IR	26.5
UPLSAPO100XO	1.40	0.13	0.17	Oil	Yes	U/BG/IR	26.5

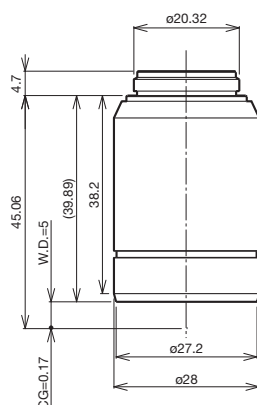
Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

*Defined with cover glass thickness shown as "CG" in the above drawings.

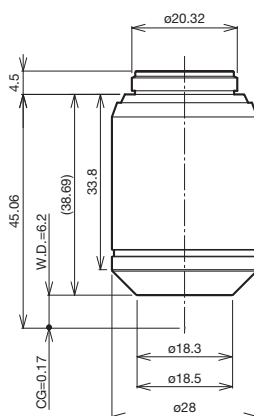
**U: UV Excitation, BG: Visible Excitation, IR: Near IR. "()" indicates that fluorescence might be slightly darker.

The PLAPON Apochromat objectives display flat images from violet to the near-infrared region of the spectrum. For quality and performance, this objective series is a splendid solution for numerous digital imaging applications.

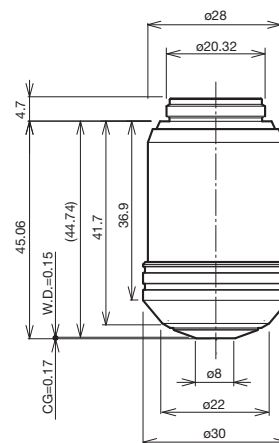
PLAPON1.25X



PLAPON2X



PLAPON60XO



unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
PLAPON1.25X	0.04	5.0	—	—	—	(BG)/(IR)	26.5
PLAPON2X	0.08	6.2	—	—	—	(BG)/(IR)	26.5
PLAPON60XO	1.42	0.15	0.17	Oil	Yes	(U)/BG/IR ***	26.5

Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

*Defined with cover glass thickness shown as "CG" in the above drawings.

**U: UV Excitation, BG: Visible Excitation, IR: Near IR. "()" indicates that fluorescence might be slightly darker.

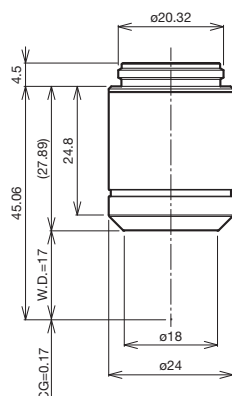
***IR excitation might cause the objective to go slightly out of focus.

Universal Plan Semi Apochromat/Plan Semi Apochromat

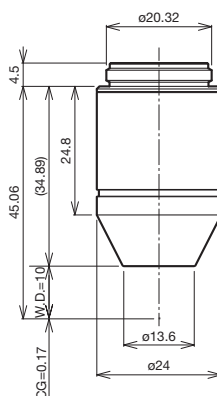
UPLFLN, PLFLN series

The UPLFLN and PLFLN objectives display flat images from violet up to the near-infrared region of the spectrum. With their high signal-to-noise (S/N) ratio, high resolution, and splendid contrast, they are especially effective in brightfield and Nomarski DIC observations. For quality and performance, this objective series is a splendid solution for numerous digital imaging applications.

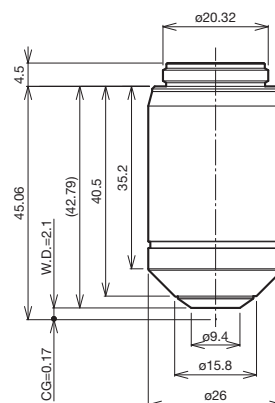
UPLFLN4X



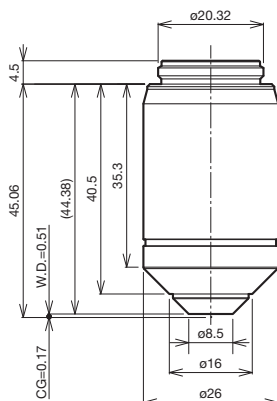
UPLFLN10X2



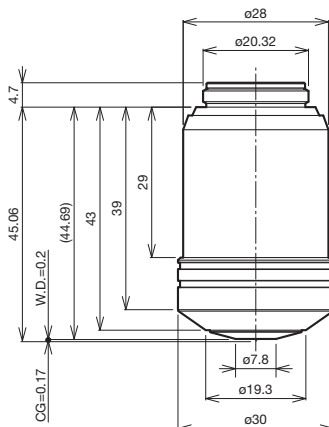
UPLFLN20X



UPLFLN40X



UPLFLN40XO



unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
UPLFLN4X	0.13	17	—	—	—	(U)/(BG)/(IR)	26.5
UPLFLN10X2	0.30	10	—	—	—	U/BG/IR ***	26.5
UPLFLN20X	0.50	2.1	0.17	—	Yes	U/BG/IR ***	26.5
UPLFLN40X	0.75	0.51	0.17	—	Yes	U/BG/IR ***	26.5
UPLFLN40XO	1.30	0.2	0.17	Oil	Yes	U/BG/IR ***	26.5

Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

*Defined with cover glass thickness shown as "CG" in the above drawings.

**U: UV Excitation, BG: Visible Excitation, IR: Near IR. "()" indicates that fluorescence might be slightly darker.

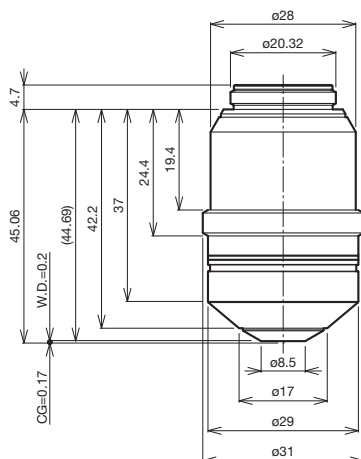
***IR excitation might cause the objective to go slightly out of focus.

Universal Plan Semi Apochromat/Plan Semi Apochromat

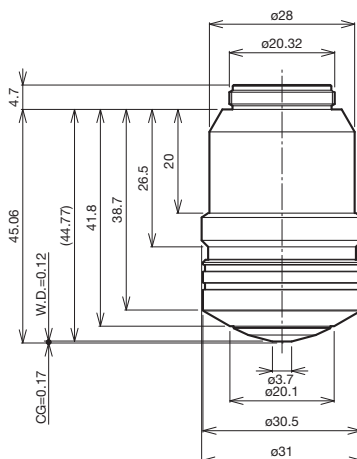
UPLFLN, PLFLN series

The UPLFLN and PLFLN objectives display flat images from violet up to the near-infrared region of the spectrum. With their high S/N ratio, high resolution, and splendid contrast, they are especially effective in brightfield and Nomarski DIC observations. For quality and performance, this objective series is a splendid solution for numerous digital imaging applications.

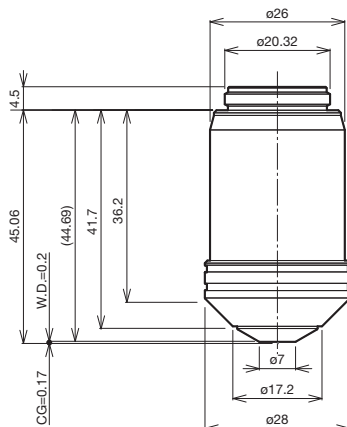
UPLFLN60X



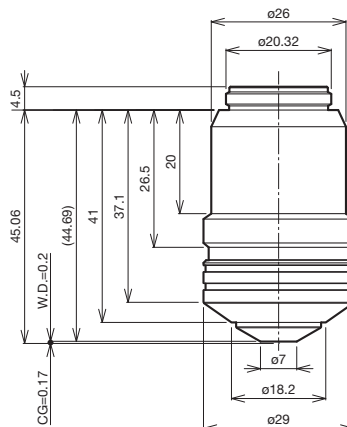
UPLFLN60XOI



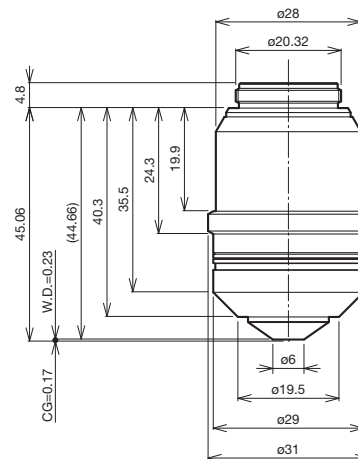
UPLFLN100XO2



UPLFLN100XOI2



PLFLN100X



unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
UPLFLN60X	0.90	0.2	0.11-0.23	—	Yes	U/BG/IR ***	26.5
UPLFLN60XOI	1.25-0.65	0.12	0.17	Oil	Yes	U/BG/IR ***	26.5
UPLFLN100XO2	1.30	0.2	0.17	Oil	Yes	U/BG/IR ***	26.5
UPLFLN100XOI2	1.3-0.6	0.2	0.17	Oil	Yes	U/BG/IR ***	26.5
PLFLN100X	0.95	0.2	0.14-0.2	—	Yes	BG	26.5

Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

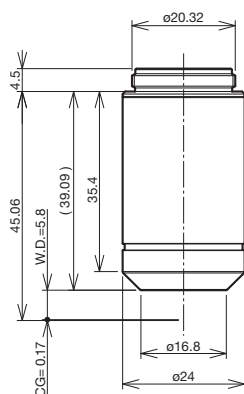
*Defined with cover glass thickness shown as "CG" in the above drawings.

**U: UV Excitation, BG: Visible Excitation, IR: Near IR. "()" indicates that fluorescence might be slightly darker.

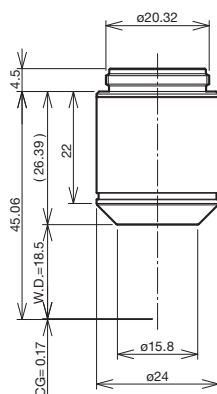
***IR excitation might cause the objective to go slightly out of focus.

The PLN standard objectives provide excellent field flatness during fluorescence, darkfield, and brightfield observation in transmitted light. These objectives are well-suited to clinical laboratory and examination work.

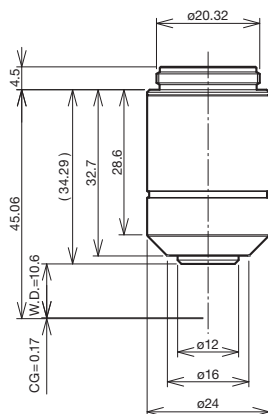
PLN2X



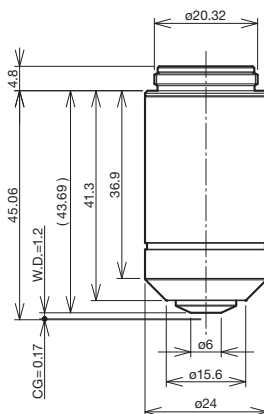
PLN4X



PLN10X



PLN20X



unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
PLN2X	0.06	5.8	—	—	—	(BG)	22.0
PLN4X	0.10	18.5	—	—	—	(BG)	22.0
PLN10X	0.25	10.6	—	—	—	(BG)	22.0
PLN20X	0.40	1.2	0.17	—	Yes	(BG)	22.0

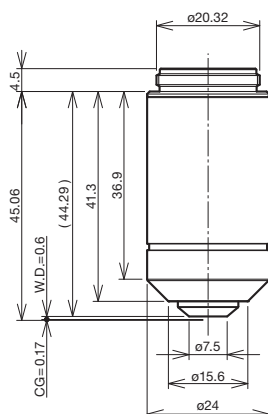
Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

*Defined with cover glass thickness shown as "CG" in the above drawings.

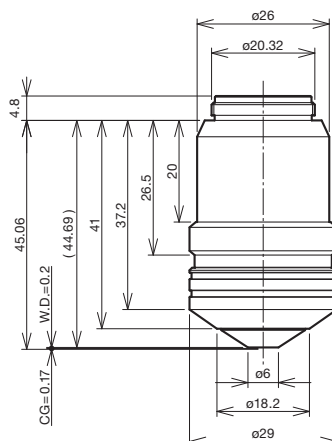
**U: UV Excitation, BG: Visible Excitation, IR: Near IR. "()" indicates that fluorescence might be slightly darker.

The PLN standard objectives provide excellent field flatness during fluorescence, darkfield, and brightfield observation in transmitted light. These objectives are well-suited to clinical laboratory and examination work.

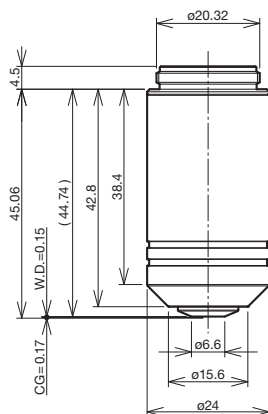
PLN40X



PLN50XOI



PLN100XO



unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
PLN40X	0.65	0.6	0.17	—	Yes	(BG)	22.0
PLN50XOI	0.9-0.5	0.2	—	Oil	Yes	(BG)	22.0
PLN100XO	1.25	0.15	—	Oil	Yes	(BG)	22.0

Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

*Defined with cover glass thickness shown as "CG" in the above drawings.

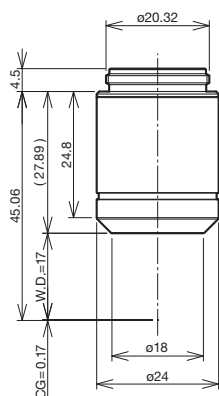
**U: UV Excitation, BG: Visible Excitation, IR: Near IR. "()" indicates that fluorescence might be slightly darker.

Universal Plan Semi Apochromat for Phase Contrast

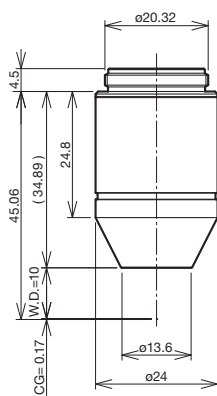
UPLFLN-PH series

The UPLFLN-PH objectives are especially effective in phase contrast observations with their high S/N ratio, high resolution, and splendid contrast. These objectives display flat images from violet up to the near-infrared region of the spectrum.

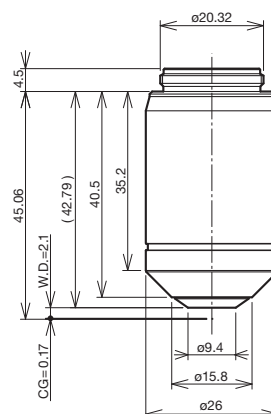
UPLFLN4XPH



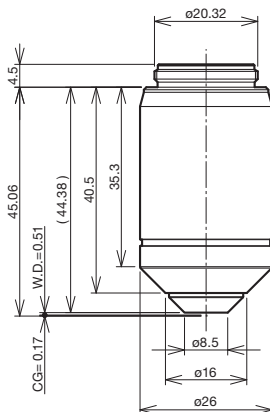
UPLFLN10X2PH



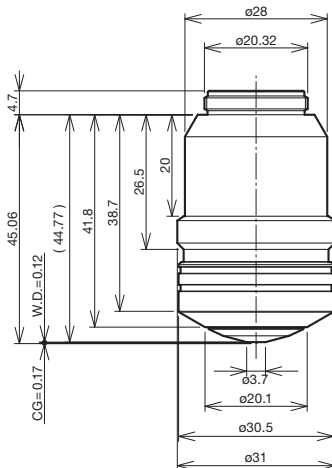
UPLFLN20XPH



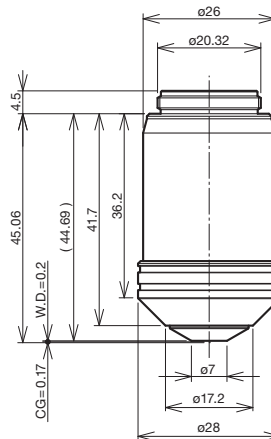
UPLFLN40XPH



UPLFLN60XOIPH



UPLFLN100XO2PH



unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
UPLFLN4XPH	0.13	17	—	—	—	U/BG/IR ***	26.5
UPLFLN10X2PH	0.30	10	—	—	—	U/BG/IR ***	26.5
UPLFLN20XPH	0.50	2.1	0.17	—	Yes	U/BG/IR ***	26.5
UPLFLN40XPH	0.75	0.51	0.17	—	Yes	U/BG/IR ***	26.5
UPLFLN60XOIPH	1.25–0.65	0.12	0.17	Oil	Yes	U/BG/IR ***	26.5
UPLFLN100XO2PH	1.30	0.2	0.17	Oil	Yes	U/BG/IR ***	26.5

Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

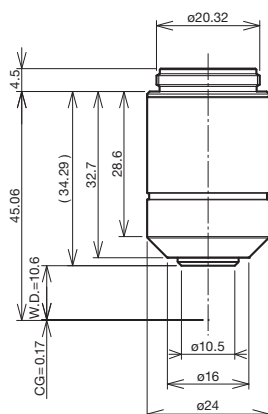
*Defined with cover glass thickness shown as "CG" in the above drawings.

**U: UV Excitation, BG: Visible Excitation, IR: Near IR. "()" indicates that fluorescence might be slightly darker.

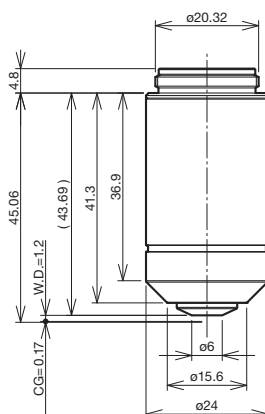
***IR excitation might cause the objective to go slightly out of focus.

The PLN-PH standard objectives provide excellent field flatness during phase contrast observation in transmitted light.

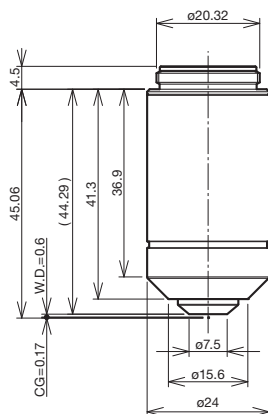
PLN10XPH



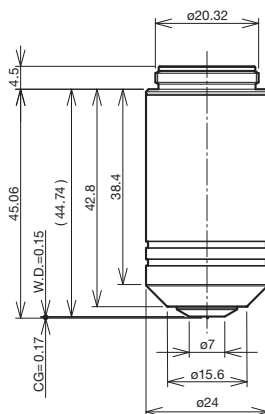
PLN20XPH



PLN40XPH



PLN100XOPH



unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
PLN10XPH	0.25	10.6	—	—	—	(BG)	22.0
PLN20XPH	0.40	1.2	0.17	—	Yes	(BG)	22.0
PLN40XPH	0.65	0.6	0.17	—	Yes	(BG)	22.0
PLN100XOPH	1.25	0.15	—	Oil	Yes	(BG)	22.0

Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

*Defined with cover glass thickness shown as "CG" in the above drawings.

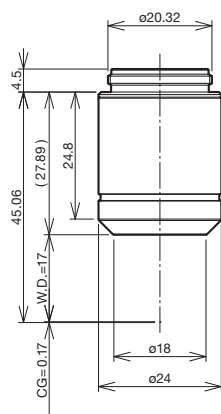
**U: UV Excitation, BG: Visible Excitation, IR: Near IR. "()" indicates that fluorescence might be slightly darker.

Universal Plan Semi Apochromat for Polarizing

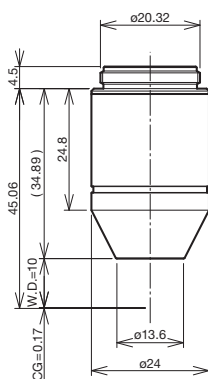
UPLFLN-P series

The UPLFLN-P universal objectives display flat images from violet up to the near-infrared region of the spectrum. These objectives reduce internal strain to a minimum and are designed for polarizing, Nomarski DIC, brightfield, and fluorescence microscopy.

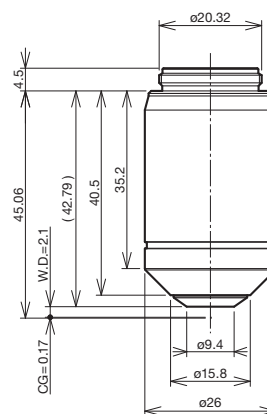
UPLFLN4XP



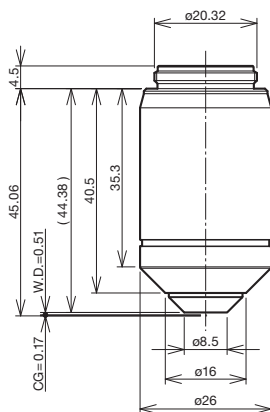
UPLFLN10XP



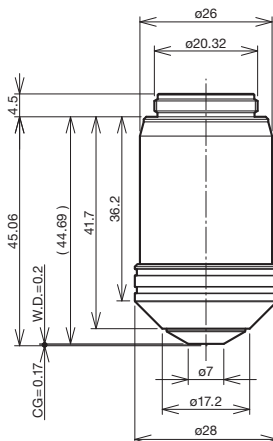
UPLFLN20XP



UPLFLN40XP



UPLFLN100XOP



unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
UPLFLN4XP	0.13	17	—	—	—	(U)/(BG)	26.5
UPLFLN10XP	0.30	10	—	—	—	U/BG	26.5
UPLFLN20XP	0.50	2.1	0.17	—	Yes	U/BG	26.5
UPLFLN40XP	0.75	0.51	0.17	—	Yes	U/BG	26.5
UPLFLN100XOP	1.30	0.2	0.17	Oil	Yes	U/BG	26.5

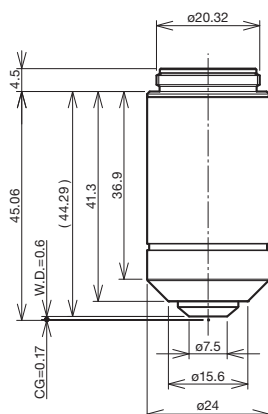
Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

*Defined with cover glass thickness shown as "CG" in the above drawings.

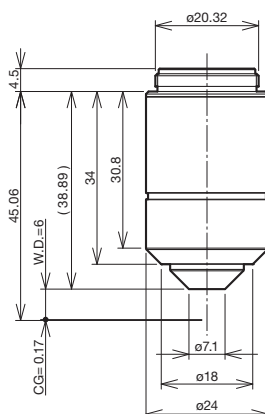
**U: UV Excitation, BG: Visible Excitation, IR: Near IR. "()" indicates that fluorescence might be slightly darker.

The PLN-P and ACHN-P are cost-efficient objectives designed for transmitted polarized light observations.

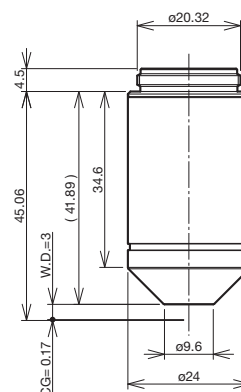
PLN4XP



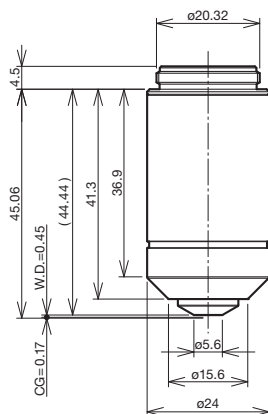
ACHN10XP



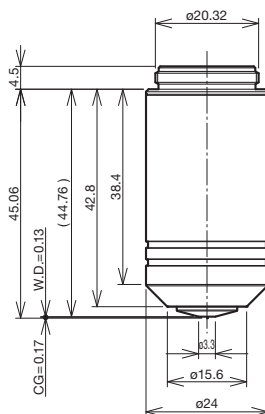
ACHN20XP



ACHN40XP



ACHN100XOP



unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
PLN4XP	0.10	18.5	—	—	—	(BG)	22.0
ACHN10XP	0.25	6	—	—	—	(BG)	22.0
ACHN20XP	0.40	3	0.17	—	—	(BG)	22.0
ACHN40XP	0.65	0.45	0.17	—	Yes	(BG)	22.0
ACHN100XOP	1.25	0.13	—	Oil	Yes	(BG)	22.0

Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

*Defined with cover glass thickness shown as "CG" in the above drawings.

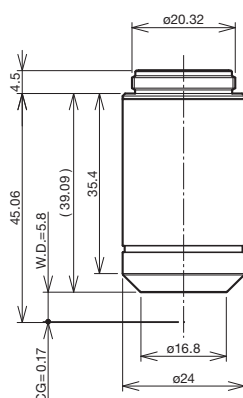
**U: UV Excitation, BG: Visible Excitation, IR: Near IR. "()" indicates that fluorescence might be slightly darker.

Plan Achromat (ND)

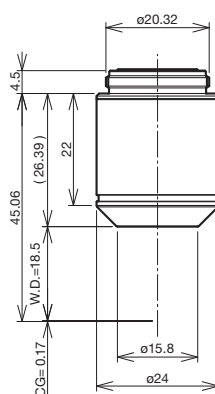
PLN-CY, PLFLN-CY series

The PLN-CY and PLFLN-CY standard objectives provide excellent field flatness. These objectives, equipped with neutral density (ND) filters, provide the same level of brightness, even if the magnification is changed, thereby removing the need for brightness adjustment.

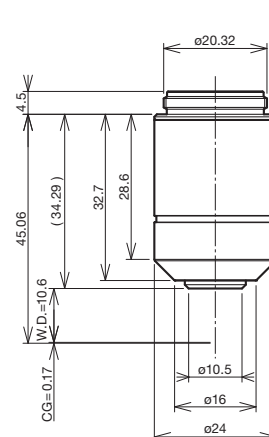
PLN2XCY



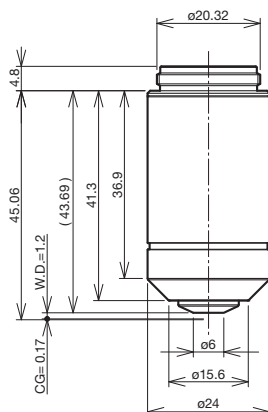
PLN4XCY



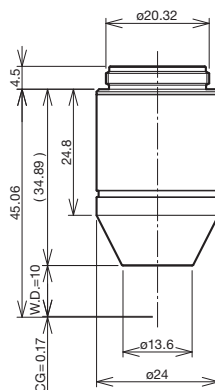
PLN10XCY



PLN20XCY



PLFLN10XCY



unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
PLN2XCY	0.06	5.8	—	—	—	—	22.0
PLN4XCY	0.10	18.5	—	—	—	—	22.0
PLN10XCY	0.25	10.6	—	—	—	(BG)	22.0
PLN20XCY	0.40	1.2	0.17	—	—	(BG)	22.0
PLFLN10XCY	0.30	9.9	—	—	—	BG	26.5

Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

*Defined with cover glass thickness shown as "CG" in the above drawings.

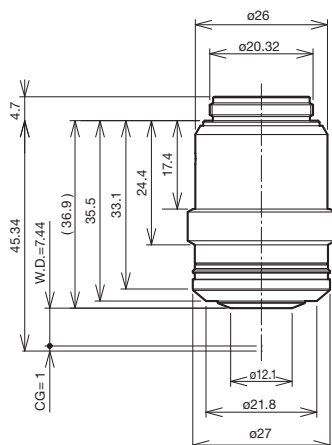
**U: UV Excitation, BG: Visible Excitation, IR: Near IR. "()" indicates that fluorescence might be slightly darker.

Long Working Distance Universal Plan Semi Apochromat

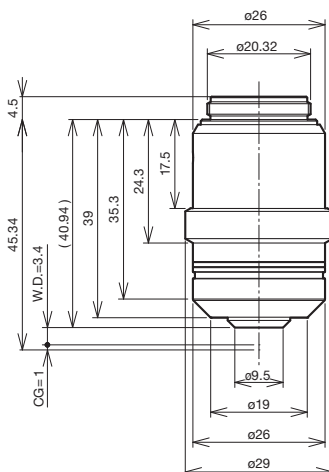
LUCPLFLN series

The LUCPLFLN long working distance, universal objectives display flat images from violet up to the near-infrared region of the spectrum. These objectives are dedicated to tissue culture observations through bottles and dishes, offering high contrast and splendid resolution in brightfield, DIC, and fluorescence observations.

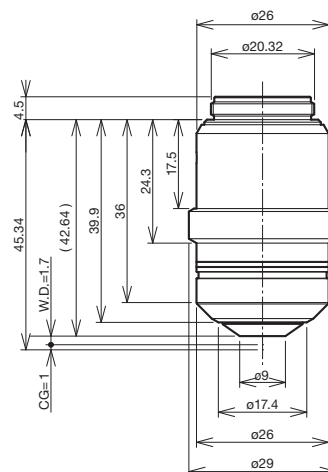
LUCPLFLN20X



LUCPLFLN40X



LUCPLFLN60X



unit: mm

Objectives (Magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
LUCPLFLN20X	0.45	7.8–6.6	0–2	—	—	U/BG/IR ***	22.0
LUCPLFLN40X	0.60	4–2.7	0–2	—	—	U/BG/IR ***	22.0
LUCPLFLN60X	0.70	2.2–1.5	0.1–1.3	—	—	U/BG/IR ***	22.0

Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

*Defined with cover glass thickness shown as "CG" in the above drawings.

**U: UV excitation, BG: Visible Excitation, IR : Near IR. "()" indicates that fluorescence might be slightly darker.

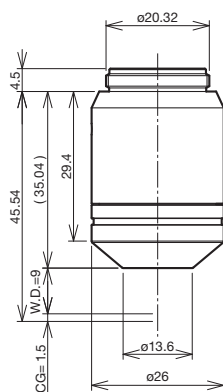
***IR excitation might cause the objective to go slightly out of focus.

Long Working Distance Universal Plan Semi Apochromat for Relief Contrast

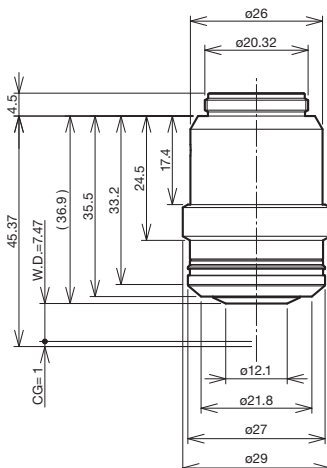
CPLFLN-RC, LUCPLFLN-RC series

The CPLFLN-RC and LUCPLFLN-RC long working distance, universal objectives display flat images from violet up to the near-infrared region of the spectrum. These objectives are designed for the observation of living cells, including oocytes. Plastic vessels can be used with these objectives for relief contrast observations.

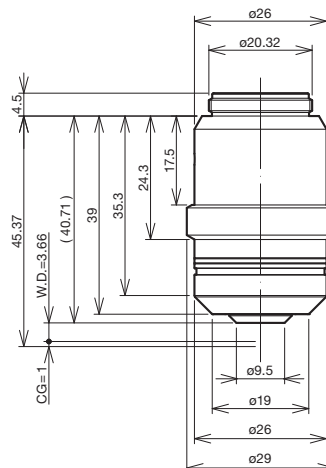
CPLFLN10XRC



LUCPLFLN20XRC



LUCPLFLN40XRC



unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
CPLFLN10XRC	0.30	9 ***	—	—	—	BG	22.0
LUCPLFLN20XRC	0.45	7.8–6.6	0–2	—	—	U/BG/IR ****	22.0
LUCPLFLN40XRC	0.60	4.2–3.0	0–2	—	—	U/BG/IR ****	22.0

Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

*Defined with cover glass thickness shown as "CG" in the above drawings.

**U: UV Excitation, BG: Visible Excitation, IR: Near IR. "()" indicates that fluorescence might be slightly darker.

***Defined by 1 mm bottom thickness of a plastic container and 0.5 mm bottom thickness of a glass heat plate (depends on the shape of container).

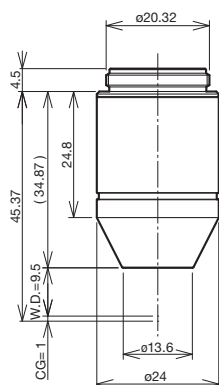
****IR excitation might cause the objective to go slightly out of focus.

Long Working Distance Universal Plan Semi Apochromat for Phase Contrast

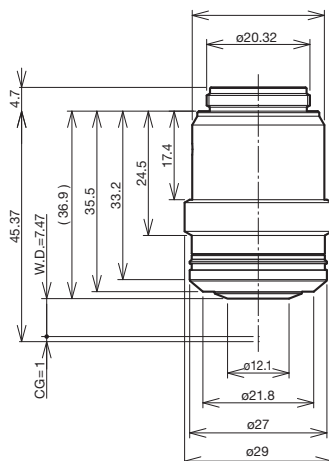
CPLFLN-PH, LUCPLFLN-PH series

The CPLFLN-PH and LUCPLFLN-PH long working distance, universal objectives display flat images from violet up to the near-infrared region of the spectrum. These objectives are specifically designed for culture specimens and are optimized to produce splendid phase contrast images, regardless of the thickness and material of the culture vessel.

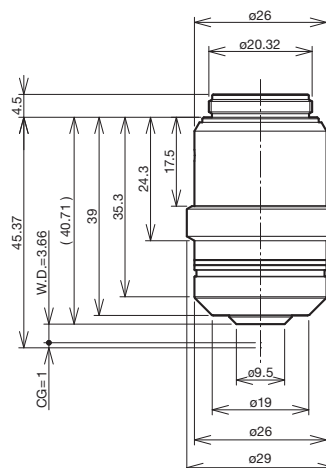
CPLFLN10XPH



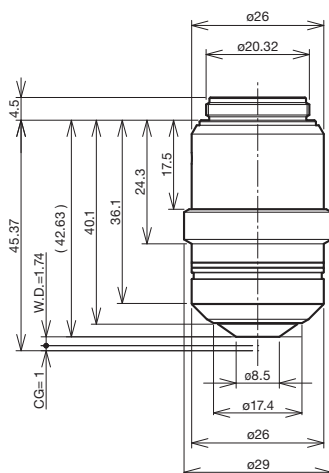
LUCPLFLN20XPH



LUCPLFLN40XPH



LUCPLFLN60XPH



unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
CPLFLN10XPH	0.30	9.5 ***	1	—	—	BG	22.0
LUCPLFLN20XPH	0.45	7.8–6.6	0–2	—	—	U/BG/IR ****	22.0
LUCPLFLN40XPH	0.60	4.2–3.0	0–2	—	—	U/BG/IR ****	22.0
LUCPLFLN60XPH	0.70	2.2–1.5	0.1–1.3	—	—	U/BG/IR ****	22.0

Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

*Defined with cover glass thickness shown as "CG" in the above drawings.

**U: UV Excitation, BG: Visible Excitation, IR: Near IR. "()" indicates that fluorescence might be slightly darker.

***Defined by 1 mm bottom thickness of a plastic container.

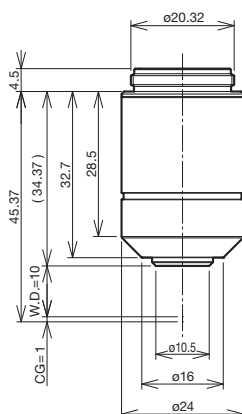
****IR excitation might cause the objective to go slightly out of focus.

Culture Specimen Objectives for Phase Contrast

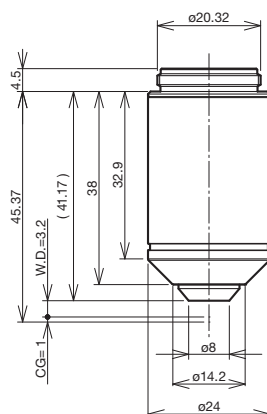
CPLN-PH, LCACHN-PH series

The CPLN-PH and LCACHN-PH standard objectives provide excellent field flatness during phase contrast observation in transmitted light.

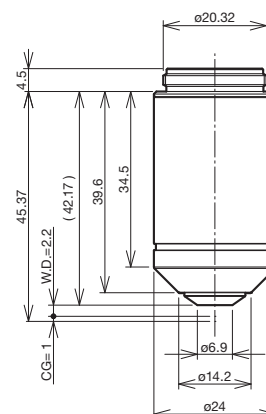
CPLN10XPH



LCACHN20XPH



LCACHN40XPH



unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
CPLN10XPH	0.25	10 ***	—	—	—	BG	22.0
LCACHN20XPH	0.40	3.2 ***	1	—	—	BG	22.0
LCACHN40XPH	0.55	2.2 ***	1	—	—	BG	22.0

Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

*Defined with cover glass thickness shown as "CG" in the above drawings.

**U: UV Excitation, BG: Visible Excitation, IR: Near IR. "()" indicates that fluorescence might be slightly darker.

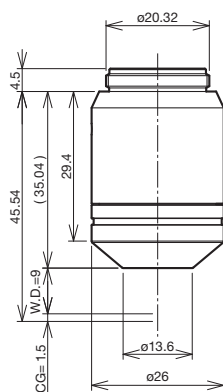
***Defined by 1 mm bottom thickness of a plastic container.

Culture Specimen Objectives for Relief Contrast

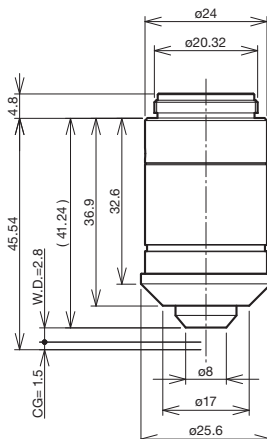
CPLN-RC, LCACHN-RC series

The CPLN-RC and LCACHN-RC standard objectives provide excellent field flatness during relief contrast observation in transmitted light. These objectives are designed for the observation of living cells, including oocytes, in plastic vessels.

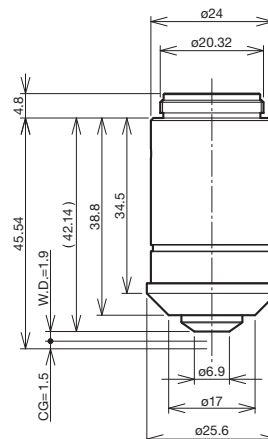
CPLN10XRC



LCACHN20XRC



LCACHN40XRC



unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
CPLN10XRC	0.25	9.7 ***	—	—	—	BG	22.0
LCACHN20XRC	0.40	2.8 ***	1.5	—	—	BG	22.0
LCACHN40XRC	0.55	1.9 ***	1.5	—	—	BG	22.0

Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

*Defined with cover glass thickness shown as "CG" in the above drawings.

**U: UV Excitation, BG: Visible Excitation, IR: Near IR. "()" indicates that fluorescence might be slightly darker.

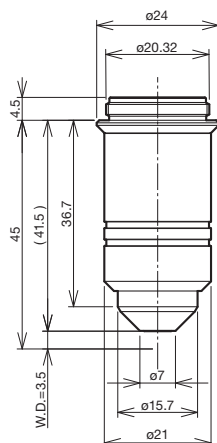
***Defined by 1 mm bottom thickness of a plastic container and 0.5 mm bottom thickness of a glass heat plate (depends on the shape of container).

No Cover Water Immersion for a Fixed Stage Upright Microscope

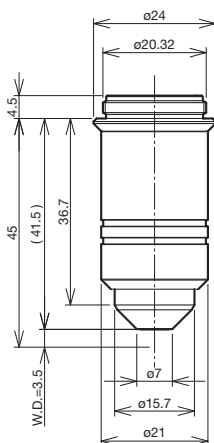
UMPLFLN-W, LUMPLFLN-W series

The UEMPLFLN, LUMPLFLN-W, and LUMFLN series of long working distance, water immersion objectives display flat images from high transmission factors up to the near-infrared region of the spectrum. These objectives achieve splendid DIC and fluorescence from the visible range to infrared and are ideal for fluorescence imaging of brain tissue, as well as other tissue and specimens.

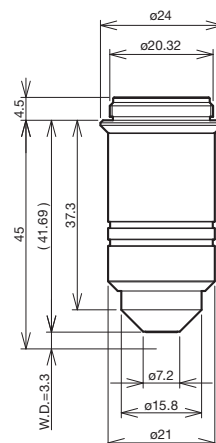
UMPLFLN10XW



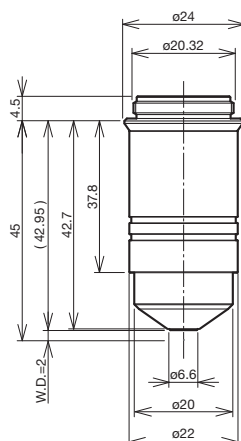
UMPLFLN20XW



LUMPLFLN40XW



LUMPLFLN60XW



unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
UMPLFLN10XW	0.30	3.50	0	Water	—	U/BG	26.5
UMPLFLN20XW	0.50	3.50	0	Water	—	U/BG	26.5
LUMPLFLN40XW	0.8	3	0	Water	—	U/BG	26.5
LUMPLFLN60XW	1.00	2	0	Water	—	U/BG	26.5

Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

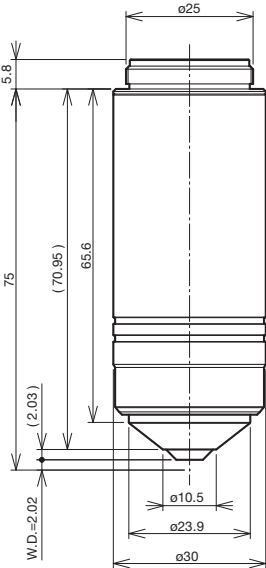
*Defined with cover glass thickness shown as "CG" in the above drawings.

**U: UV Excitation, BG: Visible Excitation, IR: Near IR. "()" indicates that fluorescence might be slightly darker.

No Cover Water Immersion for a Fixed Stage Upright Microscope
XLUMPLFLN20XW

The XLUMPLFLN-W high NA, long working distance objectives display flat images from high transmission factors up to the near-infrared region of the spectrum. These objectives achieve splendid DIC and fluorescence from the visible range to infrared. These objectives enable the measurement of cell membrane electric potential since the design of the objectives provides easy access to patch clamp electrodes.

XLUMPLFLN20XW ***



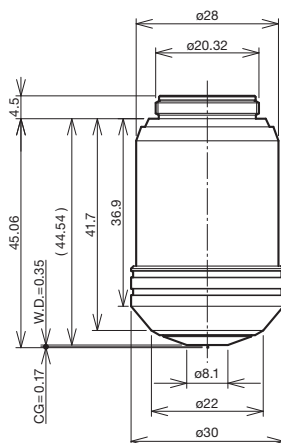
unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
XLUMPLFLN20XW ***	1.00	2	0	Water	—	U/BG/IR ****	22.0

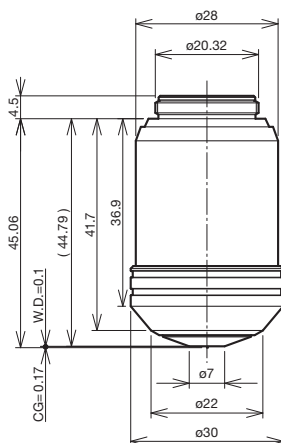
Screw: W 25 mm × 0.75 mm (1 in. × 0.03 in.)
*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV Excitation, BG: Visible Excitation, IR: Near IR. “()” indicates that fluorescence might be slightly darker.
***Special dedicated nosepiece needed (WI-SNPXLU).
****IR excitation might cause the objective to go slightly out of focus.

The UAPON340 objectives feature high transmission of 340 nm wavelength light, providing maximum performance in fluorescence microscopes using UV excitation.

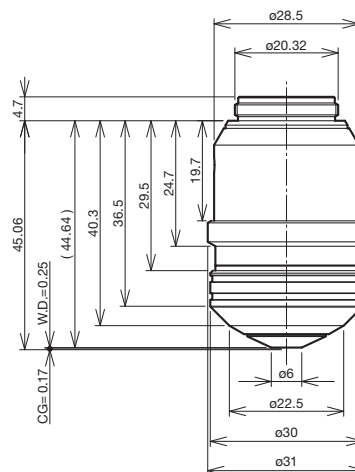
UAPON20XW340



UAPON40XO340-2



UAPON40XW340



unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
UAPON20XW340	0.70	0.35	0.17	Water	Yes	U/BG	22.0
UAPON40XO340-2	1.35	0.1	0.17	Oil	Yes	U/BG	22.0
UAPON40XW340	1.15	0.25	0.13-0.25	Water	Yes	U/BG	22.0

Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

*Defined with cover glass thickness shown as "CG" in the above drawings.

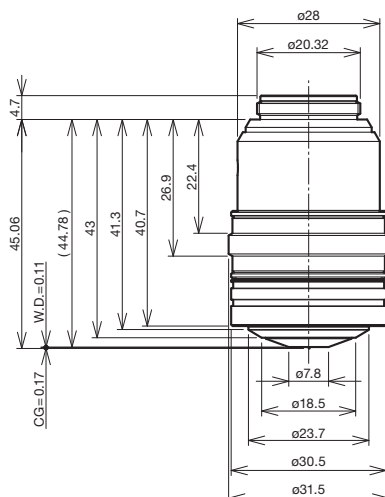
**U: UV Excitation, BG: Visible Excitation, IR: Near IR. "()" indicates that fluorescence might be slightly darker.

TIRF Objectives

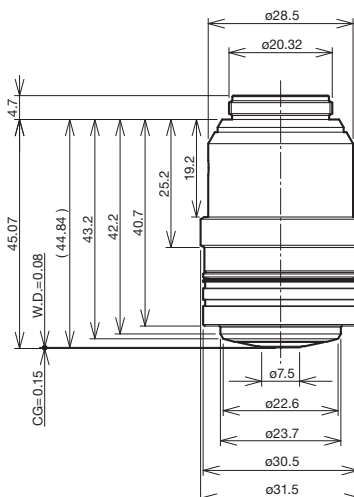
APON, UAPON series

These objectives feature the highest NA to create an evanescent wave field for high-contrast TIRF images.

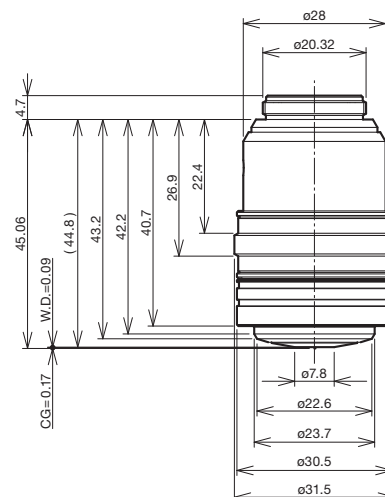
APON60XOTIRF



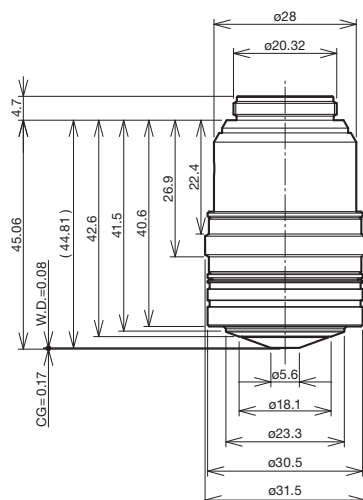
APON100XHOTIRF ***



UAPON100XOTIRF



UAPON150XOTIRF



unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	FN
APON60XOTIRF	1.49	0.1	0.13-0.19	Oil	—	(U)/BG	22.0
APON100XHOTIRF ***	1.70	0.08	0.15	Special Oil	—	BG	22.0
UAPON100XOTIRF	1.49	0.1	0.13-0.19	Oil	—	U/BG	22.0
UAPON150XOTIRF	1.45	0.08	0.13-0.19	Oil	—	U/BG	22.0

Screw: W 20.32 mm × 0.706 mm (0.8 in. × 1/36 in.)

*Defined with cover glass thickness shown as "CG" in the above drawings.

**U: UV Excitation, BG: Visible Excitation, IR: Near IR. "()" indicates that fluorescence might be slightly darker.

***Special dedicated cover glass and immersion oil needed.

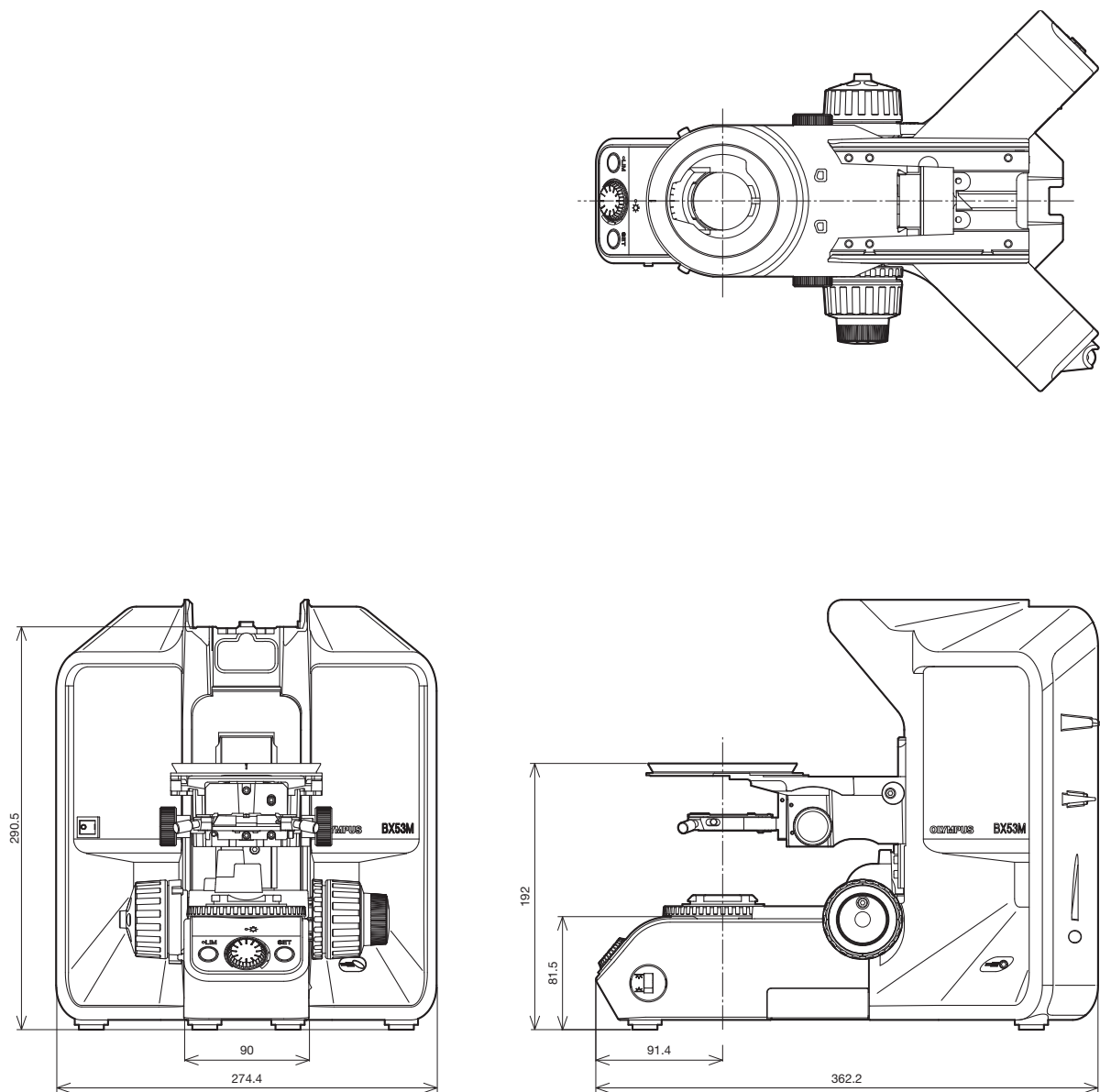
Microscope Frame

BX53M: Upright Transmitted and Reflected Light Microscope Frame

BX53MTRF-S

Designed with modularity in mind, the BX3M series provide versatility for a wide variety of material science and industrial applications. The frames are outfitted with electro-static discharge (ESD) capability to help protect electronic samples.

BX53MTRF-S



Weight: 7.6 kg Unit: mm

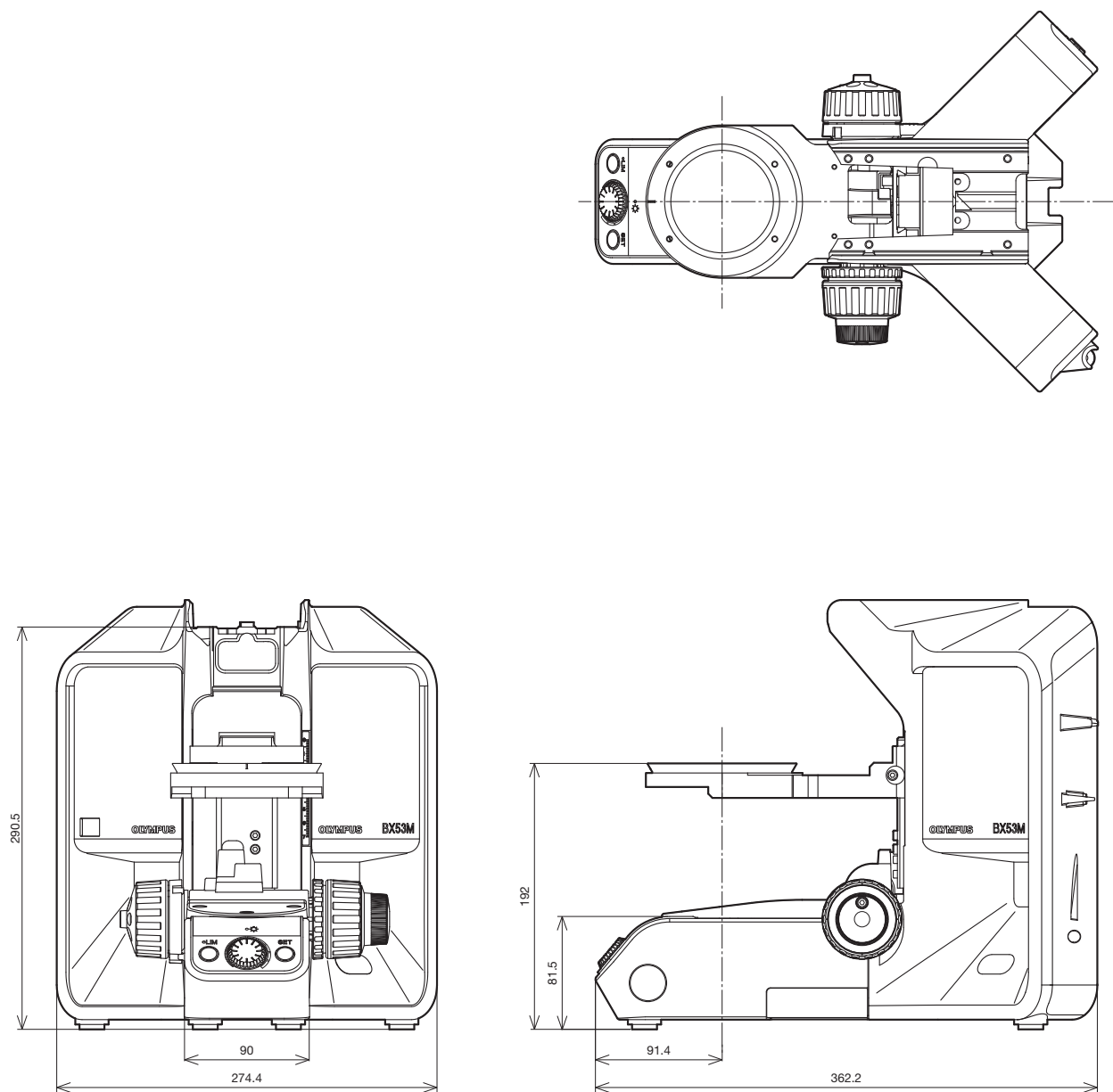
Microscope Frame

BX53M: Upright Reflected Light Microscope Frame

BX53MRF-S

Designed with modularity in mind, the BX3M series provide versatility for a wide variety of material science and industrial applications. The frames are outfitted with ESD capability to help protect electronic samples.

BX53MRF-S



Weight: 7.4 kg Unit: mm

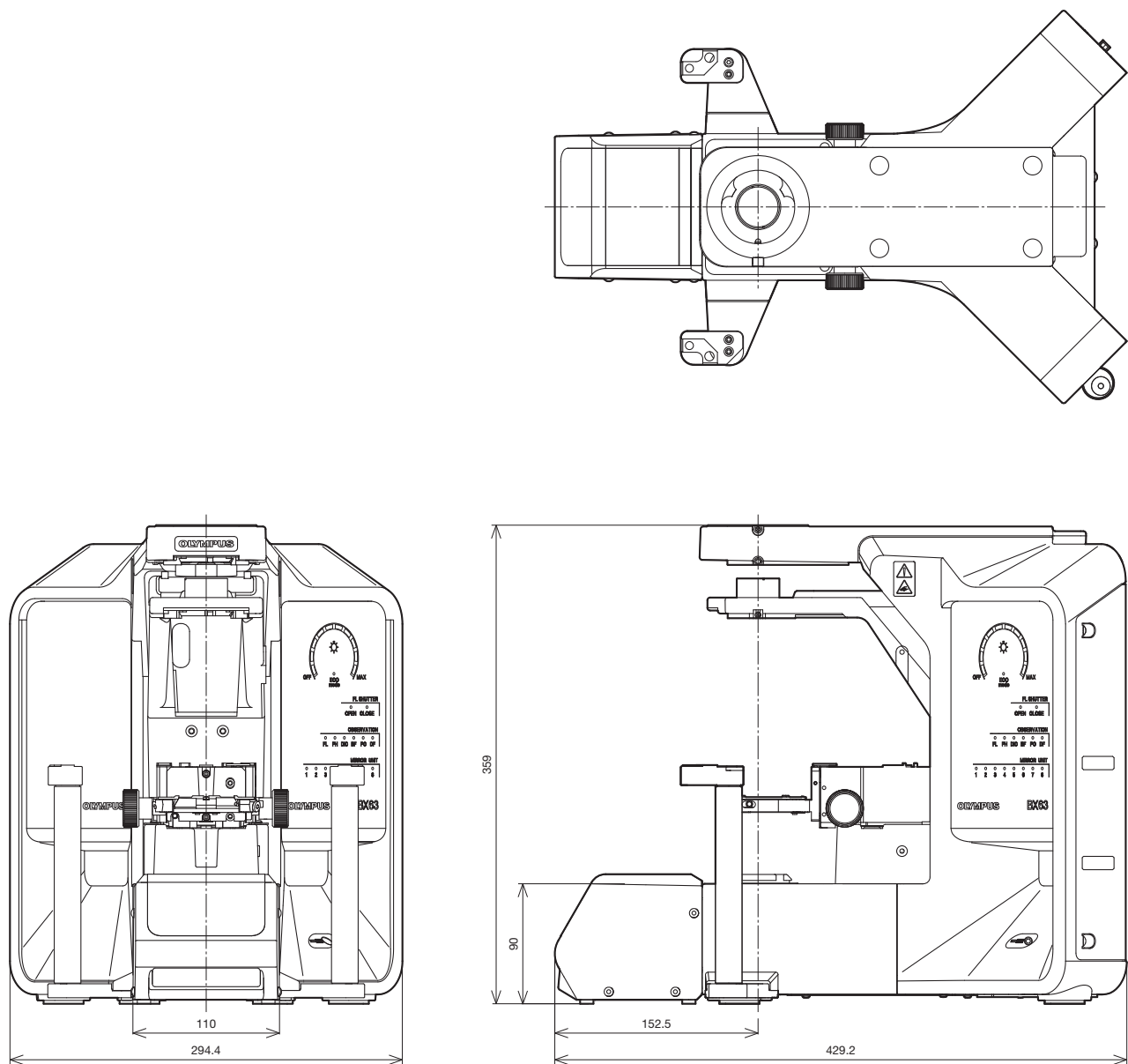
Microscope Frame

BX3: Automated Transmitted Light Microscope Frame

BX63F

This fully motorized system enables automation of complex multidimensional experiments and features a precise motorized Z-drive and splendid stability thanks to the fixed stage design.

BX63F



Weight: 14.1 kg Unit: mm

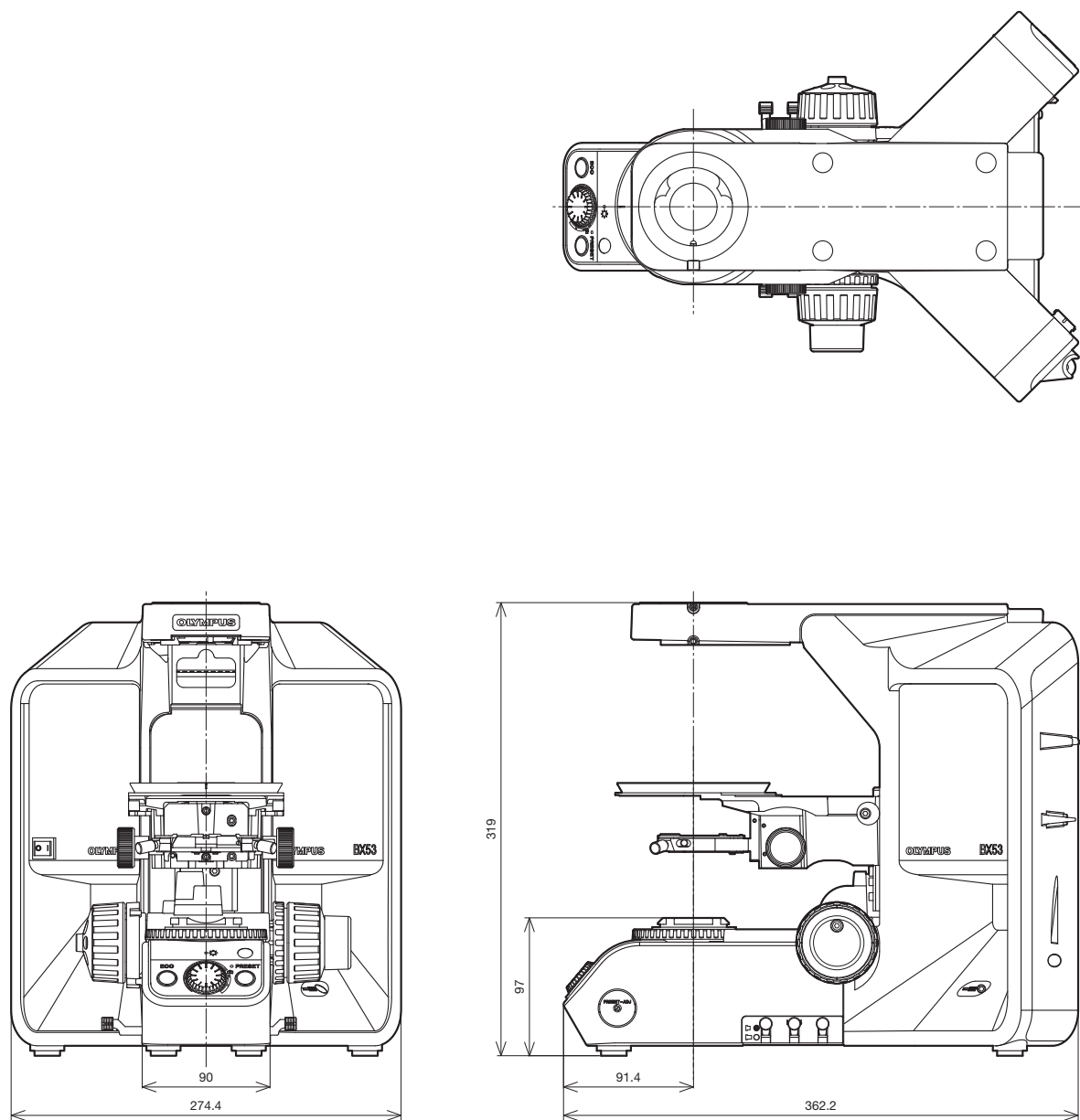
Microscope Frame

BX3: Semi-Motorized Fluorescence Transmitted Light Microscope Frame

BX53F

The entire optical path of the BX53 is designed for optimal fluorescence imaging and uses UIS2 optical components that set a new standard in precision and clarity. The modular concept enables motorization of individual components.

BX53F



Weight: 8.3 kg Unit: mm

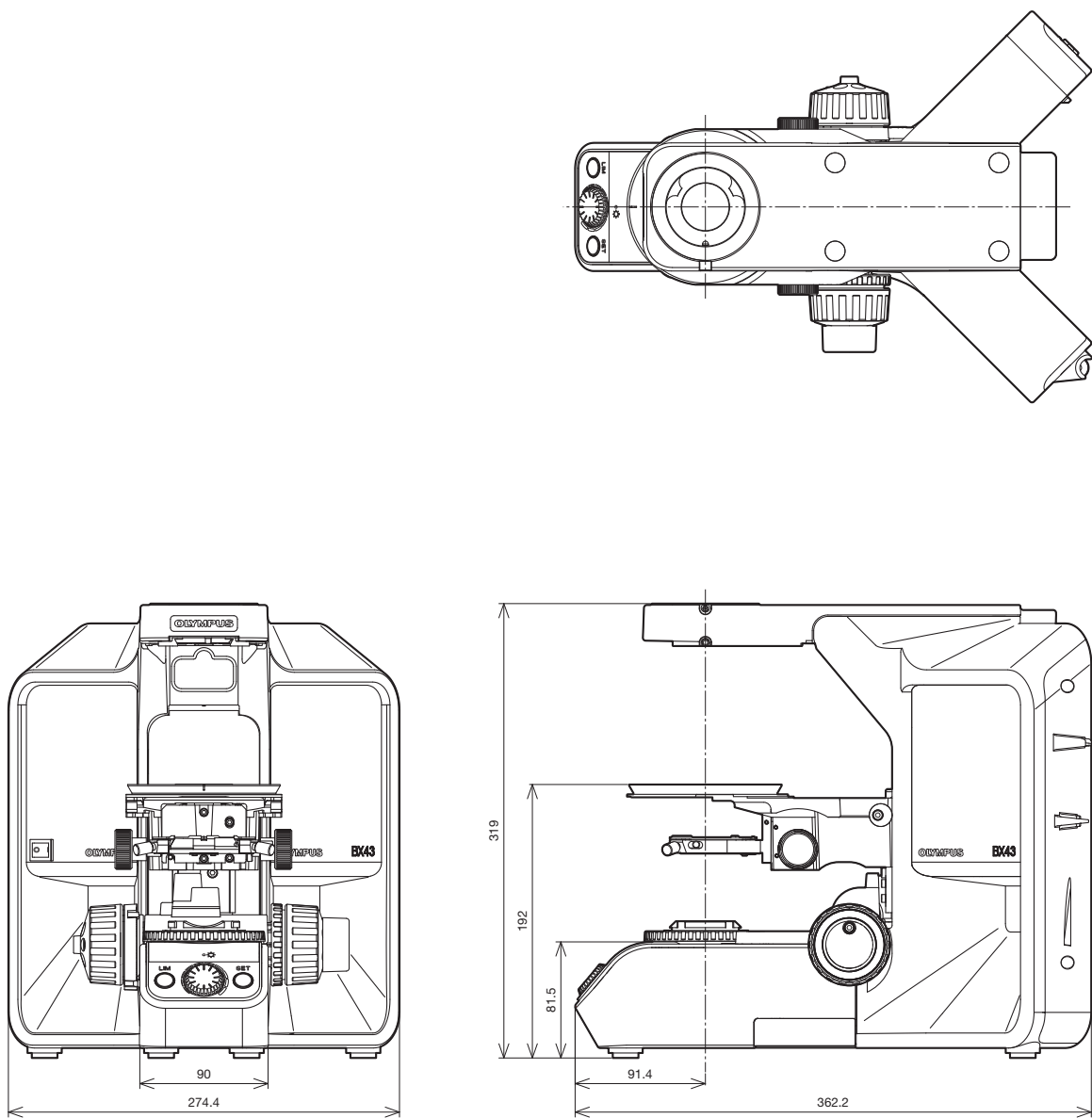
Microscope Frame

BX3: Manual System Transmitted Light Microscope Frame

BX43F

The BX43 microscope offers a wide range of features, splendid optical performance, and is the ideal platform for digital imaging. This flexible microscope offers various contrast methods and leading-edge optics combined with true-color LED illumination for true-to-life color rendering.

BX43F



Weight: 9.1 kg Unit: mm

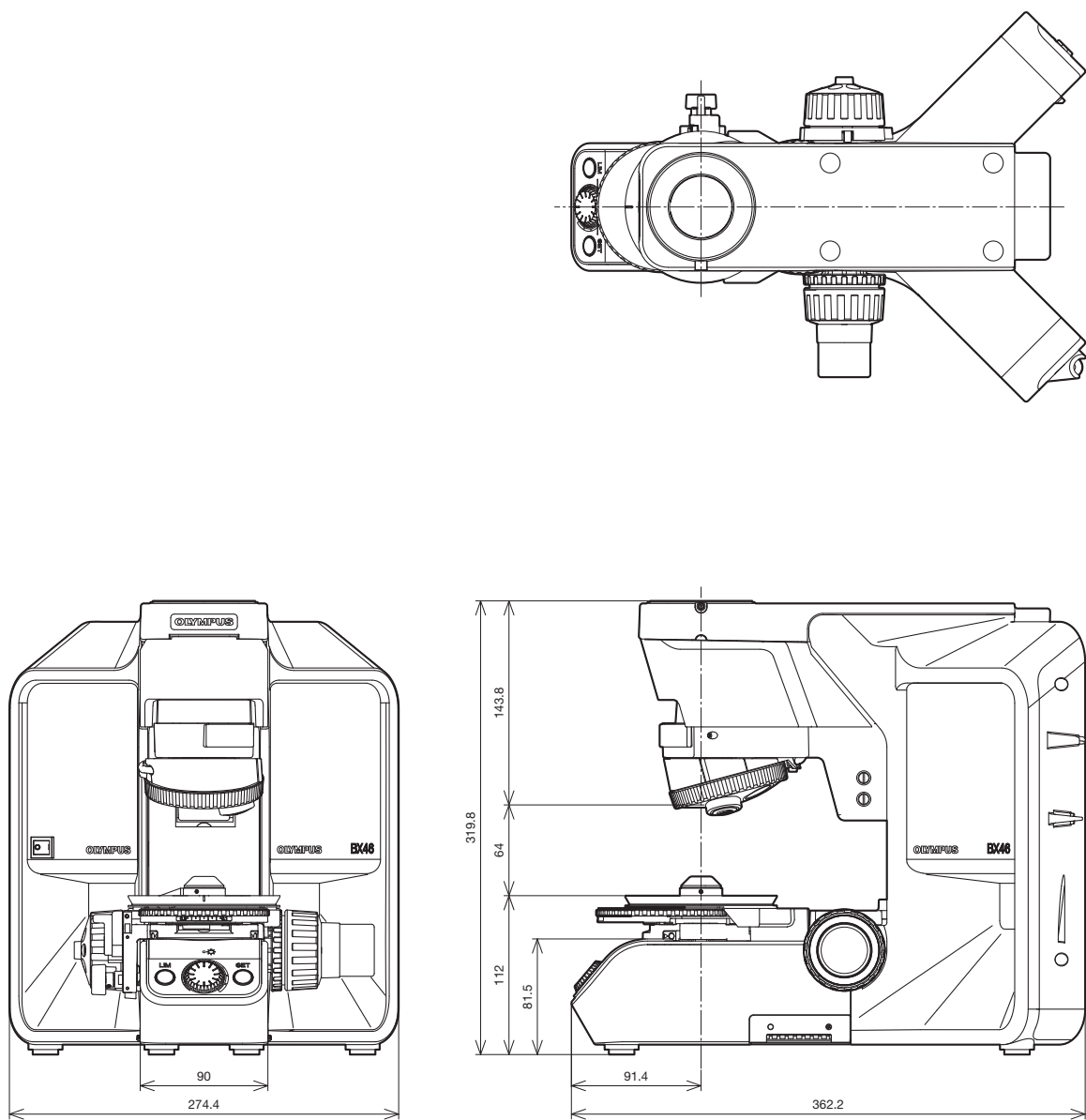
Microscope Frame

BX3: Transmitted Light Ergonomic Microscope Frame

BX46F

The BX46 features an ergonomic design with a low-position fixed stage and nosepiece focus that helps keep users comfortable while they're working.

BX46F



Weight: 9.8 kg Unit: mm

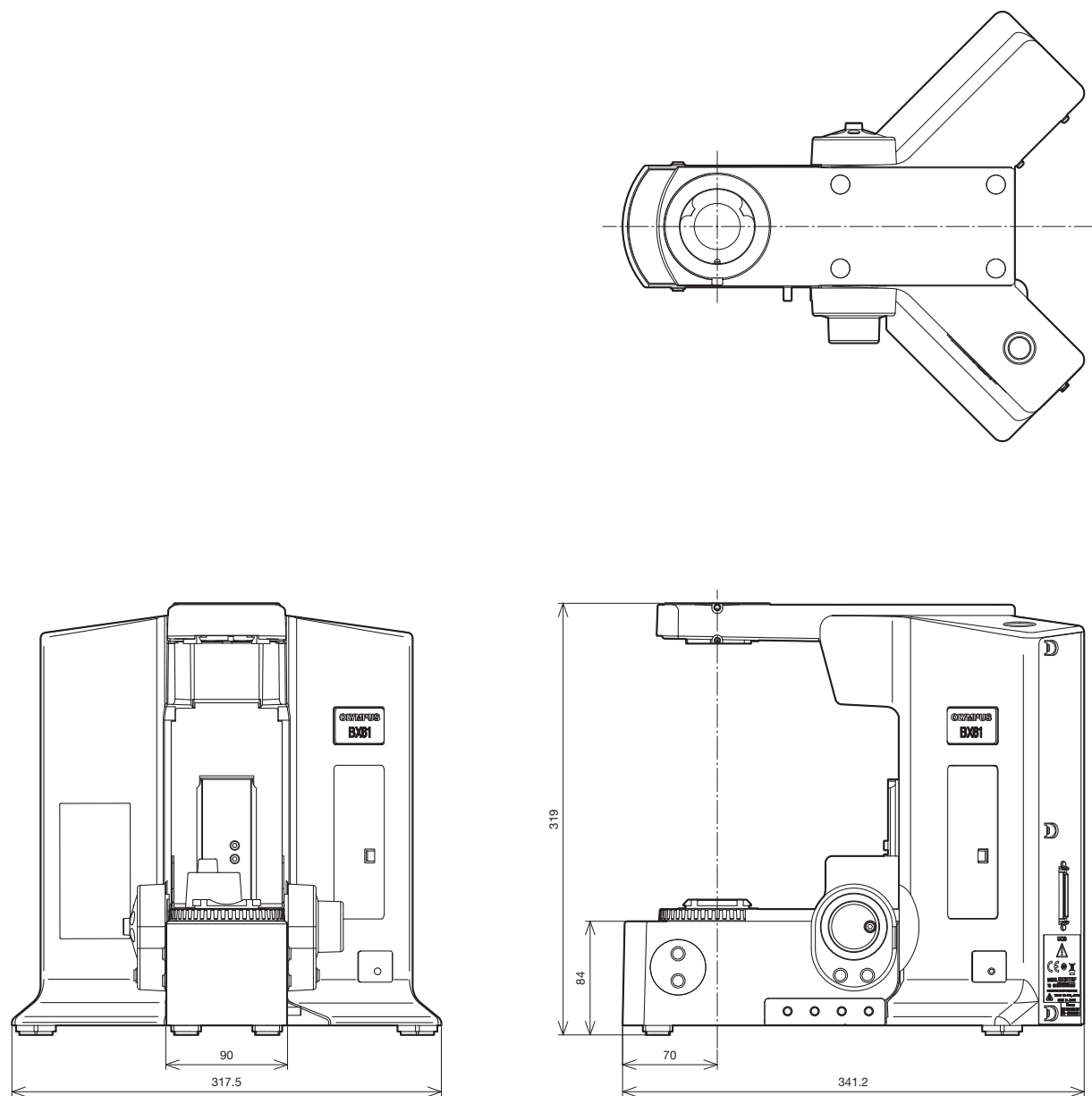
Microscope Frame

BX2: Upright Motorized Transmitted/Reflected Frame

BX61TRF

The BX61 frame is designed to incorporate a laser-based autofocus unit for active focus tracking, making inspections faster and highly reproducible.

BX61TRF



Weight: 11.4 kg Unit: mm

BXFM-F

Technical drawing of the 3200 Series Servo Motor, showing three views: front, side, and top.

Front View Dimensions:

- Overall Height: 100
- Mounting Hole Spacing: 36
- Mounting Hole Diameter: 4-M8 Depth 8 Bolt Mount Screw
- Bottom Flange Thickness: 0.5
- Bottom Flange Width: 17

Side View Dimensions:

- Overall Width: 82
- Mounting Hole Spacing: 58.5
- Mounting Hole Diameter: 35
- Output Shaft Diameter: 32H8
- Output Shaft Length: 80
- Bottom Flange Thickness: 0.5
- Bottom Flange Width: 17

Top View Dimensions:

- Overall Width: 98
- Overall Depth: 110
- Mounting Hole Spacing: 66.2
- Mounting Hole Diameter: 4-M4 Depth 7
- Bottom Flange Thickness: 0.5
- Bottom Flange Width: 17
- Output Shaft Diameter: 32H8
- Output Shaft Length: 80

Stroke and Mounting Hole Center:

- Stroke: 23
- Mounting Hole Center: 0.5

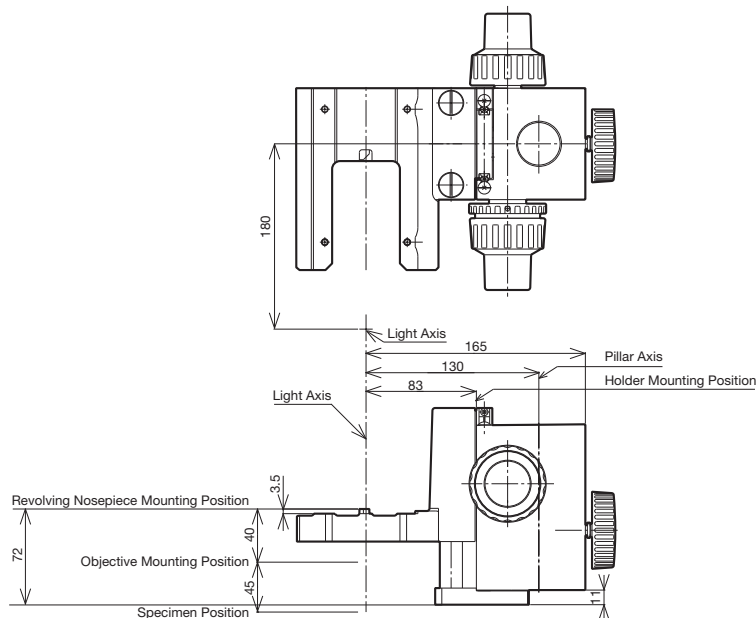
4-8

Microscope System BXFM

BXFM System Configuration Example 1

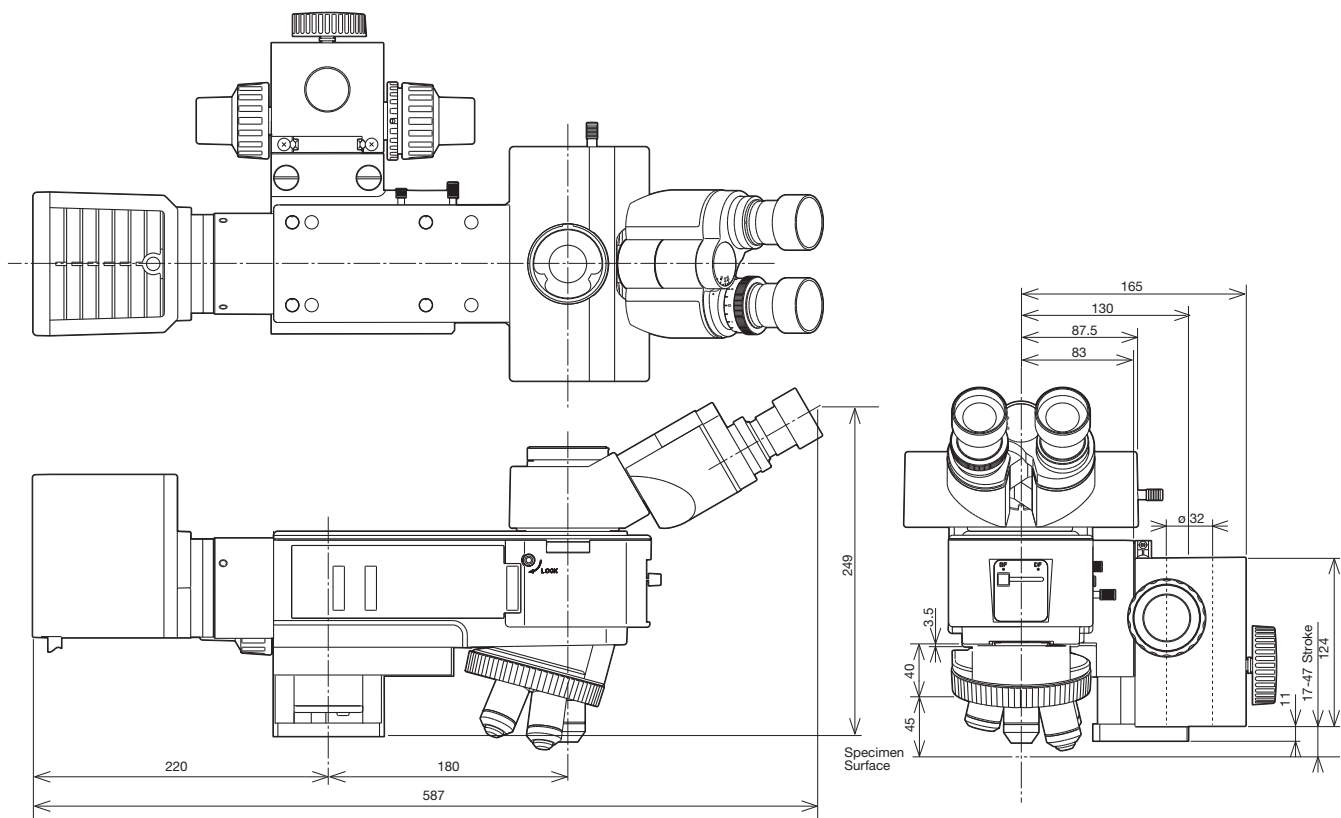
BXFM-F + BXFM-ILH + BXFM-ILHSPU

This example accommodates reflected light brightfield/darkfield and fluorescence illuminators.



Weight: 3.2kg Unit: mm

BXFM Combination Sample BXFM-F + BXFM-ILH + BXFM-ILHSPU + TR30-2 + BX-RLA2 + U-LH100L-3



*For installation dimensions, refer to the BXFM-F diagram.

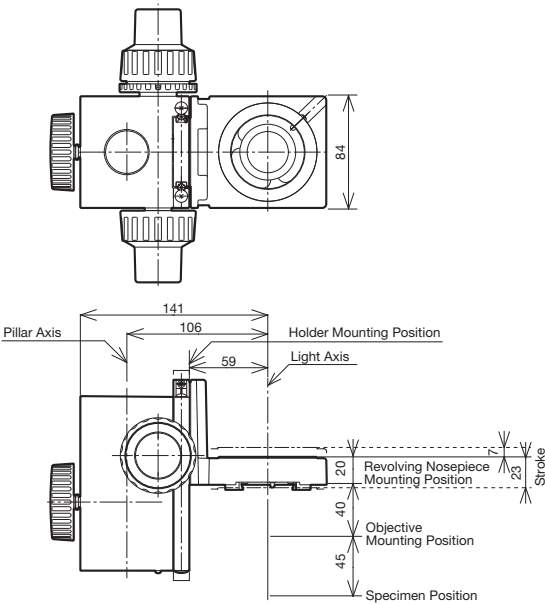
Weight: 8.2kg (excludes objectives) Unit: mm

Microscope System BXFM

BXFM System Configuration Example 2

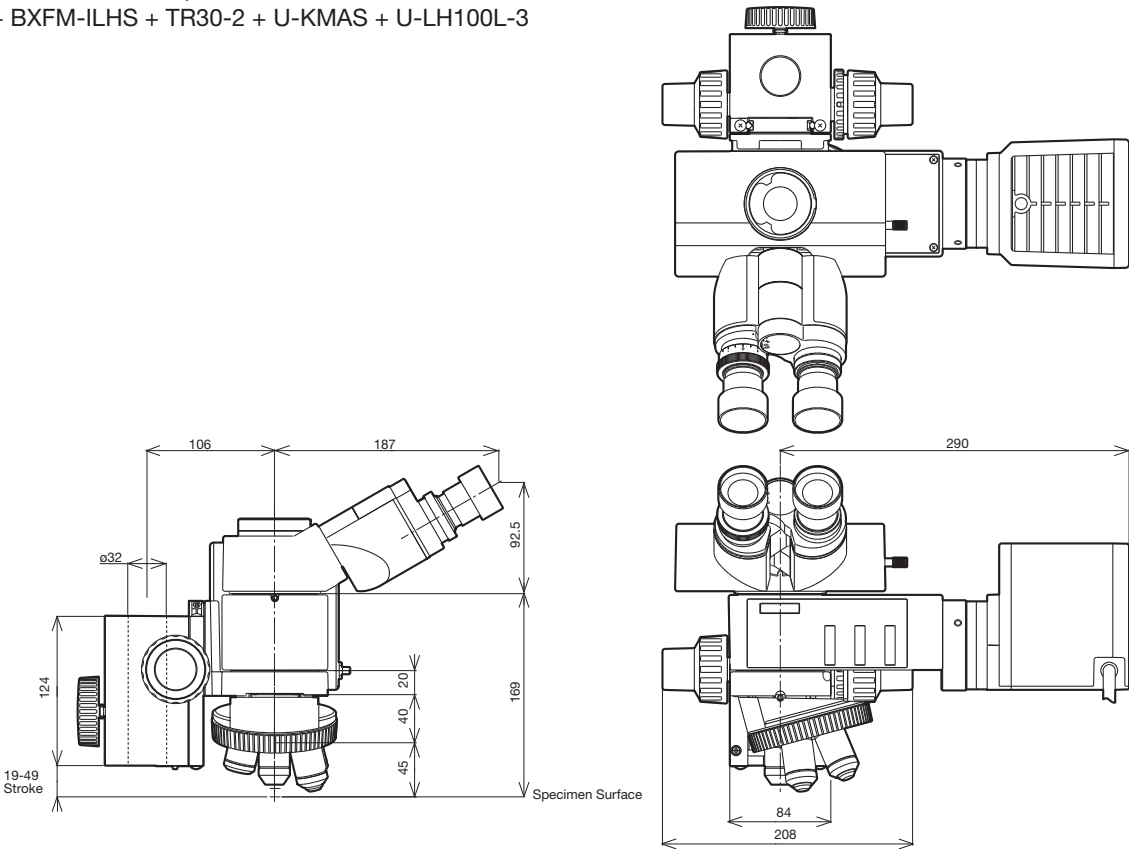
BXFM-F + BXFM-ILHS

This system example contains a compact focusing unit that is suitable for being integrated into existing equipment.



Weight: 2.4kg Unit: mm

BXFM-S Combination Sample BXFM-F + BXFM-ILHS + TR30-2 + U-KMAS + U-LH100L-3



*For installation dimensions, refer to the BXFM-F diagram.

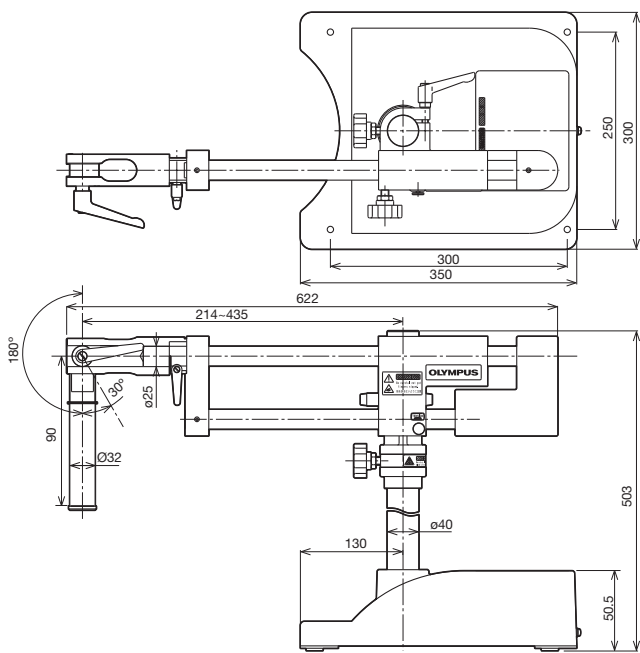
Weight: 5.5 kg (excludes objectives) Unit: mm

Microscope System BXFM

Stands for the BXFM

A wide variety of stands are available to suit different applications and purposes.

SZ2-STU2
Universal Stand Type 2

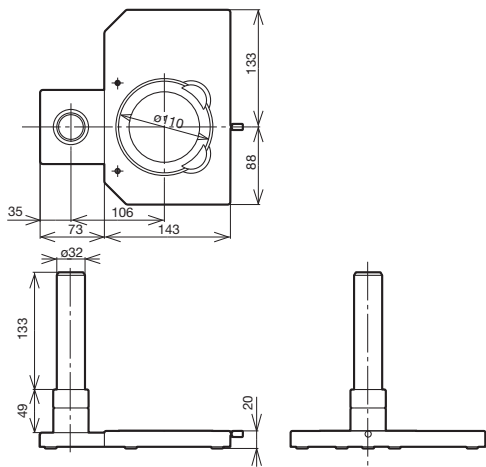


*The rotation angle of the horizontal arm can be restricted to 90 degrees with a stopper.

Major Specifications

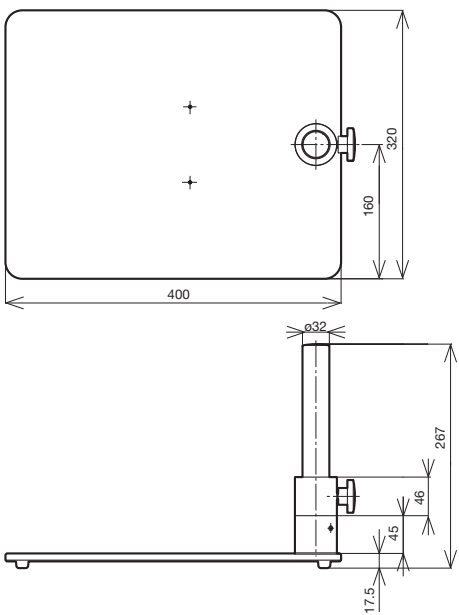
Item	Specifications
1 Diameter of Focusing Arm or Fixing Section of Tube	ø32 mm
2 Vertical Pole Diameter	ø40 mm
3 Diameter of Horizontal Poles	ø25 mm (both upper and lower poles)
4 Stroke	Horizontal: 234 mm Vertical: 205 mm
5 Movement Range	Horizontal: 541 (435 + 106) mm max. (vertical pole — BXFM-S optical axis)
6 Maximum Specimen Weight	Forward: 10 kg (within 90-degree area) Transverse Direction: 6 kg Backward Direction: 7 kg (at maximum stroke)
7 Weight	30 kg

U-ST
Compact Stand



Weight: 1.8 kg

SZ-STL
Large Stand



Weight: 5 kg

Unit: mm

Illumination Units

Reflected Light Illuminators for the BX53M Microscope

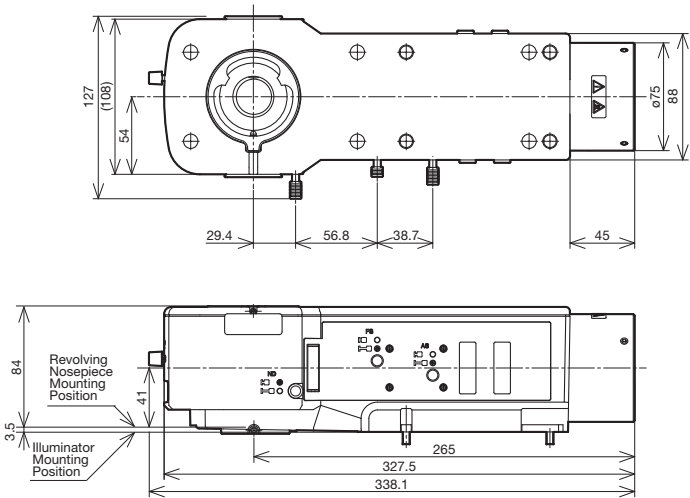
Manual illuminators for brightfield, darkfield, and fluorescence applications.

BX3M-RLA-S

Reflected Light Illuminator for BF/DF for the BX53M Microscope

Accessories

Unit Name	Description	Weight (g)
U-25LBD	Daylight Color Filter	20
U-25LBA	Halogen Color Filter	20
U-25IF550	Green Filter	20
U-25L42	UV-Cut Filter	20
U-25Y48	Yellow Filter	20
U-25FR	Frost Filter	20
U-25	Empty Filter (for use with user's ø25 mm filters)	<20
U-25ND50	ND Filter	20
U-25ND25	ND Filter	20
U-25ND6	ND Filter	20



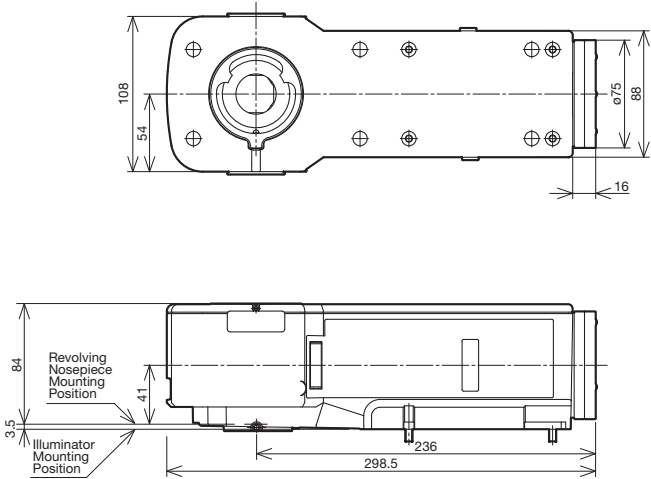
Weight: 3.0 kg

BX3M-KMA-S

BF Reflected LED Light Illuminator for the BX53M Microscope

Accessories

Unit Name	Description	Weight (g)
U-AN-2	Fixed Analyzer	50
U-AN360-3	Rotatable Analyzer	79
U-PO3	Fixed Polarizer	71
U-POTP3	Fixed Polarizer (use with U-DICRH)	71
U-25LBD	Daylight Color Filter	20
U-25LBA	Halogen Color Filter	20
U-25IF550	Green Filter	20
U-25L42	UV-Cut Filter	20
U-25Y48	Yellow Filter	20
U-25FR	Frost Filter	20
U-25	Empty Filter (for use with user's ø25 mm filters)	<20
U-25ND50	ND Filter	20
U-25ND25	ND Filter	20
U-25ND6	ND Filter	20



Weight: 2.4 kg
Unit: mm

Illumination Units

Coded Reflected Light Illuminator for the BX53M Frame

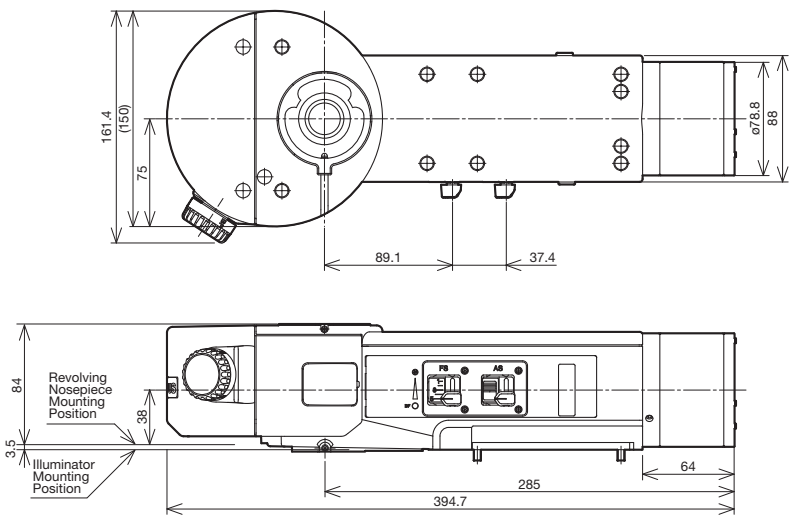
Coded illuminators require users to physically change the device's settings, but the microscope's software automatically recognizes these changes.

BX3M-RLAS-S

Coded Reflected Light Illuminator for BF/DF for the BX53M Frame

Accessories

Unit Name	Description	Weight (g)
U-AN-2	Fixed Analyzer	50
U-AN360-3	Rotatable Analyzer	79
U-PO3	Fixed Polarizer	71
U-POTP3	Fixed Polarizer (use with U-DICRH)	71
U-25LBD	Daylight Color Filter	20
U-25LBA	Halogen Color Filter	20
U-25IF550	Green Filter	20
U-25L42	UV-Cut Filter	20
U-25Y48	Yellow Filter	20
U-25FR	Frost Filter	20
U-25	Empty Filter (for use with user's ø25 mm filters)	<20
U-25ND50	ND Filter	20
U-25ND25	ND Filter	20
U-25ND6	ND Filter	20



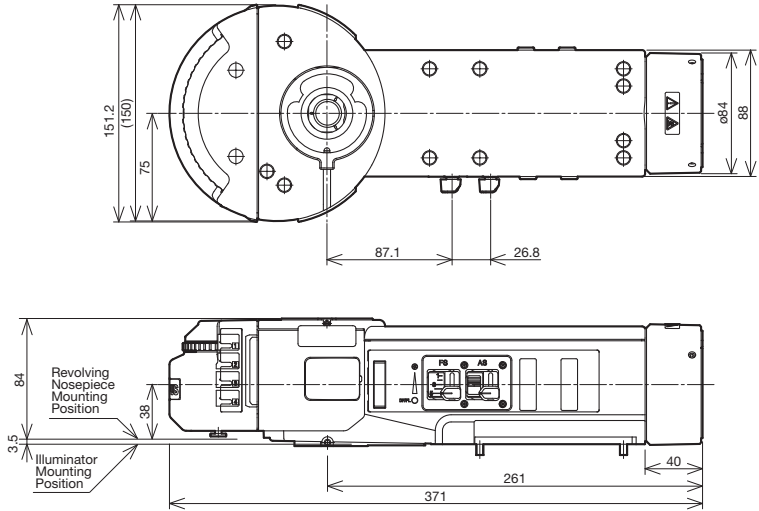
Weight: 3.6 kg

BX3M-URAS-S

Coded Universal Reflected Illuminator for the BX53M Frame

Accessories

Unit Name	Description	Weight (g)
U-AN-2	Fixed Analyzer	50
U-AN360-3	Rotatable Analyzer	79
U-PO3	Fixed Polarizer	71
U-POTP3	Fixed Polarizer (use with U-DICRH)	71
U-25LBD	Daylight Color Filter	20
U-25LBA	Halogen Color Filter	20
U-25IF550	Green Filter	20
U-25L42	UV-Cut Filter	20
U-25Y48	Yellow Filter	20
U-25FR	Frost Filter	20
U-25	Empty Filter (for use with user's ø25 mm filters)	<20
U-25ND50	ND Filter	20
U-25ND25	ND Filter	20
U-25ND6	ND Filter	20



Weight: 3.2 kg

Unit: mm

Illumination Units

Reflected Illuminator for the BX3 Series

Manual illuminators for brightfield, darkfield, and fluorescence applications.

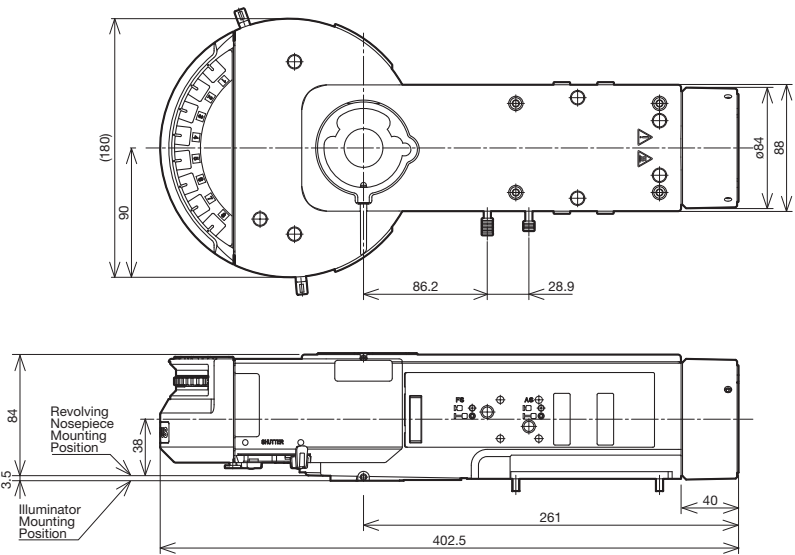
BX3-URA

Universal Reflected Illuminator for the BX3 Series

A total of eight fluorescence mirror units can be attached for multi color fluorescence observations.

Accessories

Unit Name	Description	Weight (g)
U-AN-2	Fixed analyzer	50
U-AN360-3	Rotatable analyzer	79
U-PO3	Fixed polarizer	71
U-POTP3	Fixed polarizer (use with U-DICRH)	71
U-25LBD	Daylight color filter	20
U-25LBA	Halogen color filter	20
U-25IF550	Green filter	20
U-25L42	UV-cut filter	20
U-25Y48	Yellow filter	20
U-25FR	Frost filter	20
U-25	Empty filter, for use with user's ø25 mm filters	<20
U-25ND50	ND filter	20
U-25ND25	ND filter	20
U-25ND6	ND filter	20



Weight: 3.8 kg

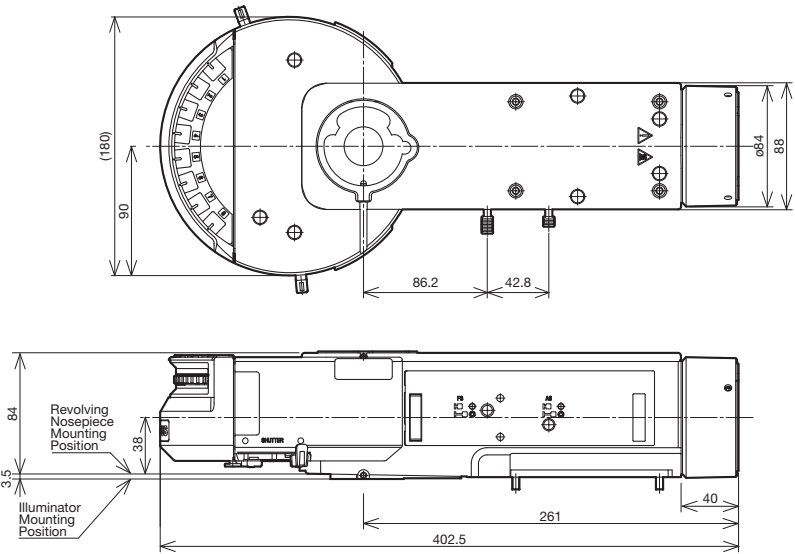
BX3-RFAS

Coded Fluorescence Illuminator for the BX3 Series

The eight fluorescence mirror units feature coded functionality.

Accessories

Unit Name	Description	Weight (g)
U-AN-2	Fixed analyzer	50
U-AN360-3	Rotatable analyzer	79
U-PO3	Fixed polarizer	71
U-POTP3	Fixed polarizer (use with U-DICRH)	71
U-25LBD	Daylight color filter	20
U-25LBA	Halogen color filter	20
U-25IF550	Green filter	20
U-25L42	UV-cut filter	20
U-25Y48	Yellow filter	20
U-25FR	Frost filter	20
U-25	Empty filter, for use with user's ø25 mm filters	<20
U-25ND50	ND filter	20
U-25ND25	ND filter	20
U-25ND6	ND filter	20



Weight: 3.9 kg

Unit: mm

Illumination Units

Reflected Light Illuminator for the BX2 Series

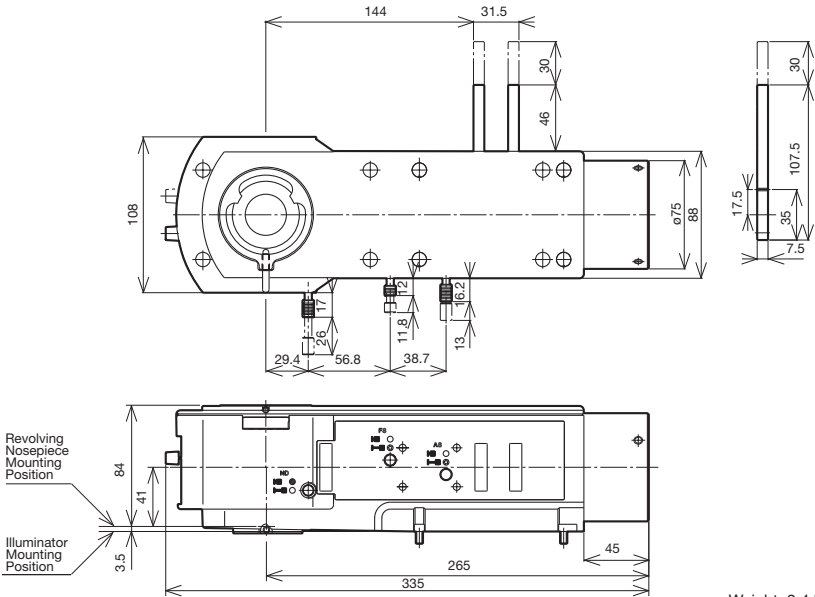
BX-RLA2

Reflected Light Illuminator for BF/DF

Neutral density (ND) filters are linked when exchanging between brightfield and darkfield.

Accessories

Unit Name	Description	Weight (g)
U-25LBD	Daylight Color Filter	20
U-25IF550	Green Filter	20
U-25ND6	ND Filter	20
U-25ND25	ND Filter	20
U-25FR	Frost Filter	20
U-25L42	UV-Cut Filter	20
U-PO3	Fixed Polarizer	71
U-POTP3	Fixed Polarizer (use with U-DICRH)	71
U-AN360-3	Rotatable Analyzer	79
U-AN	Analyzer Slider for Reflected Light	50
U-DICR	DIC Slider for Reflected Light	130
U-DICRH	DIC Slider for Reflected Light (Resolution Type)	130
U-DICRHC	DIC Slider for Reflected Light (Contrast Type)	130



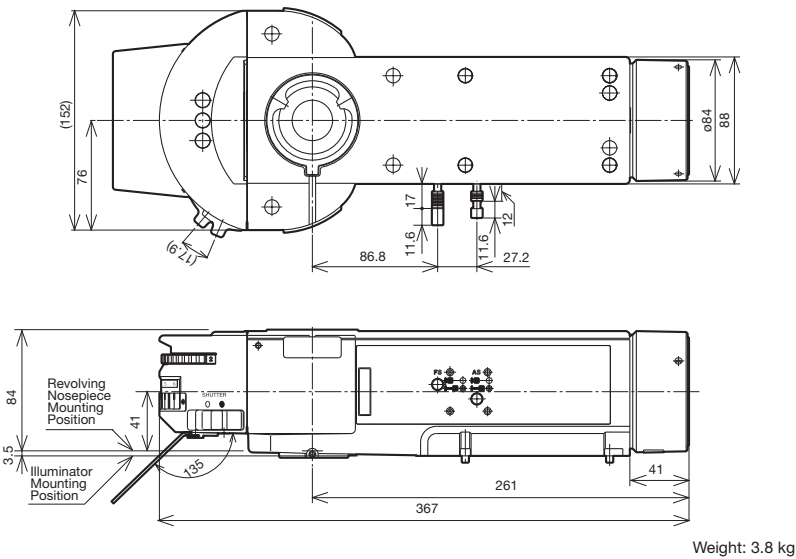
BX-URA2

Universal Reflected Light Illuminator

This illuminator is optimized for observations ranging from brightfield to fluorescence.
Six mirror units can be simultaneously attached to this reflected light illuminator.

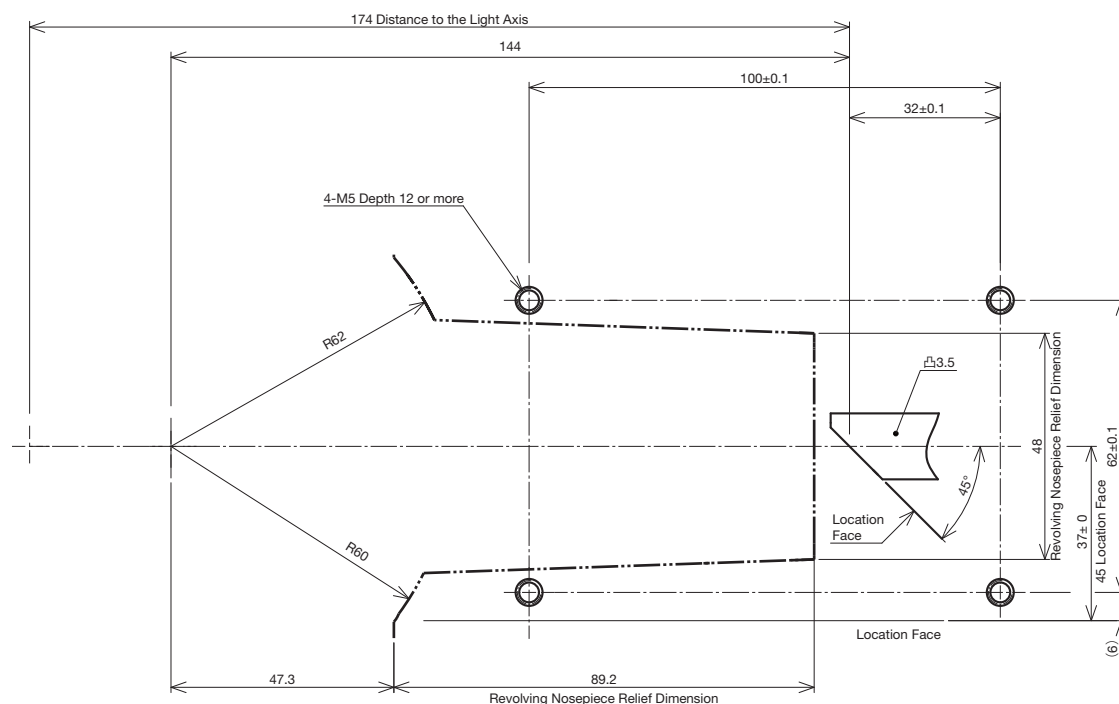
Accessories

Unit Name	Description	Weight (g)
U-25LBD	Daylight Color Filter	20
U-25IF550	Green filter	20
U-25ND6	ND Filter	20
U-25ND25	ND Filter	20
U-25FR	Frost Filter	20
U-25L42	UV-Cut Filter	20
U-PO3	Fixed Polarizer	71
U-POTP3	Fixed Polarizer (use with U-DICRH)	71
U-AN360-3	Rotatable Analyzer	79
U-AN	Analyzer Slider for Reflected Light	50
U-DICR	DIC Slider for Reflected Light	130
U-DICRH	DIC Slider for Reflected Light (Resolution Type)	130
U-DICRHC	DIC Slider for Reflected Light (Contrast Type)	130
U-MBF3	Mirror Unit for Reflected Brightfield	80
U-MDF3*	Mirror Unit for Reflected Darkfield	80
U-MDIC3	Mirror Unit for Reflected DIC	80
U-MBFL3	Mirror Unit for Reflected Brightfield, for a High Intensity Light Source	80
U-MWUS3	Fluorescence Mirror Unit for Reflected (U Excitation)	80
U-MWBS3	Fluorescence Mirror Unit for Reflected (B Excitation)	80
U-MWGS3	Fluorescence Mirror Unit for Reflected (G Excitation)	80



Illumination Units

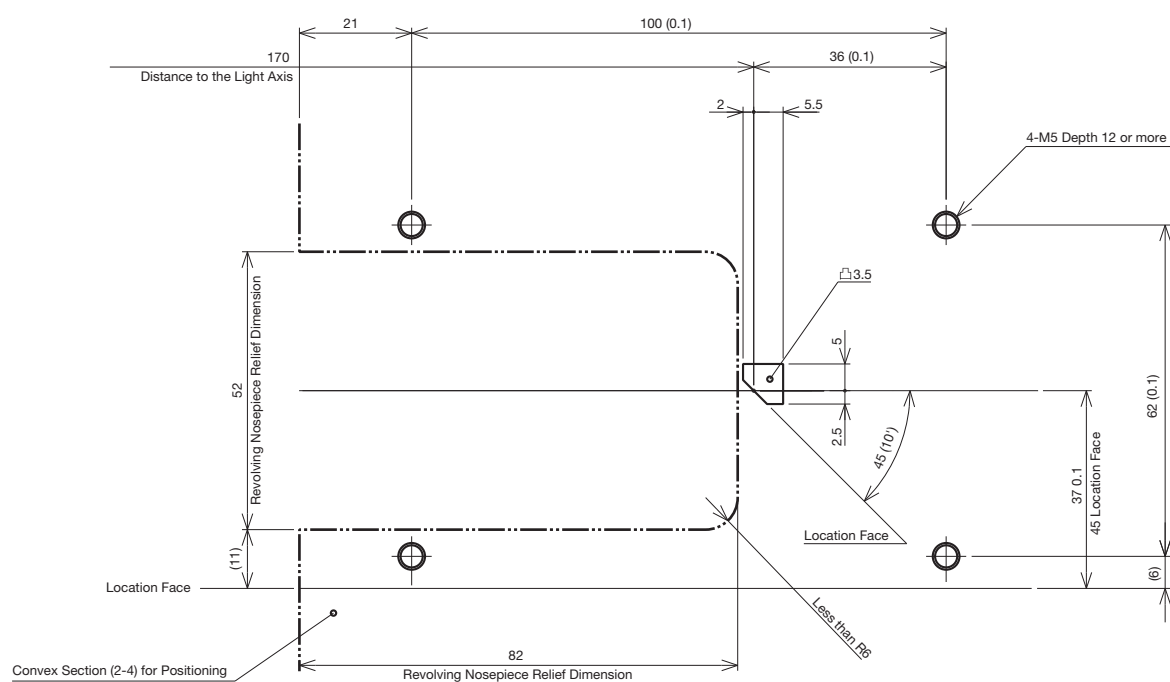
Mounting Dimensions of Illuminator (BX3M-RLA-S, BX3M-RLAS-S, BX3M-URAS-S, BX3M-KMA-S, BX3-RFAS, BX3-URA)



Fix illuminator using four M5 screws and projection for fastening.

Unit: mm

Mounting Dimensions of Illuminators (BX-RLA2 and BX-URA2)



Fix illuminator using four M5 screws and projection for fastening.

Unit: mm

Illumination Units

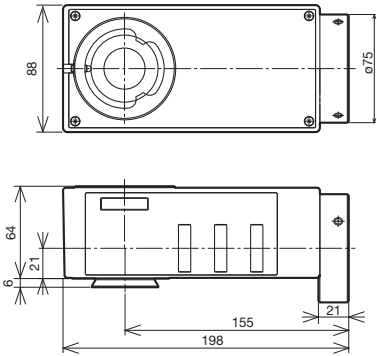
Compact Reflected Light Illuminator for BF U-KMAS

Very compact reflected light illuminator with reduced depth.

U-KMAS

Accessories

Unit Name	Description	Weight (g)
U-25LBD	Daylight Color Filter	20
U-25IF550	Green Filter	20
U-25ND6	ND Filter	20
U-25ND25	ND Filter	20
U-25FR	Frost Filter	20
U-25L42	UV-Cut Filter	20
U-PO3	Fixed Polarizer	71
U-POTP3	Fixed Polarizer (use with U-DICRH)	71
U-AN360-3	Rotatable Analyzer	79
U-AN	Analyzer Slider for Reflected Light	50
U-DICR	DIC Slider for Reflected Light	130
U-DICRH	DIC Slider for Reflected Light (Resolution Type)	130
U-DICRHC	DIC Slider for Reflected Light (Contrast Type)	130



Weight: 1.2 kg

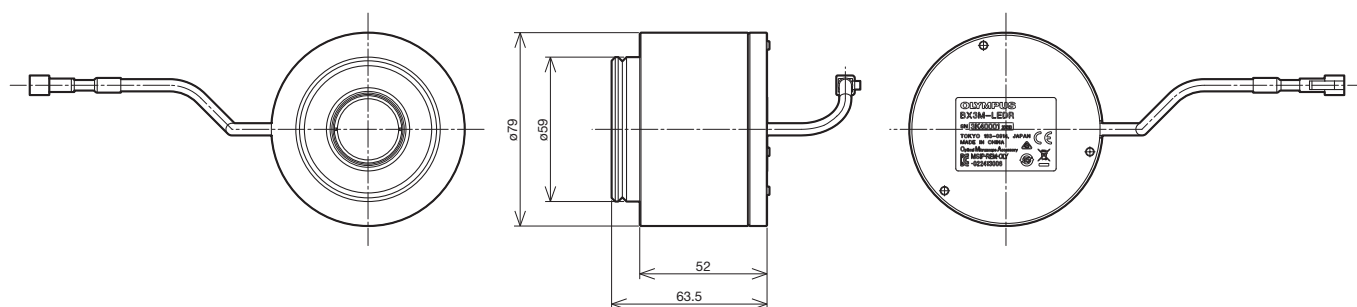
Light Source Units

LED Lamp Housing for the BX53M Microscope

The BX3M microscope utilizes a high-intensity white LED light source for both reflected and transmitted light. High-intensity light support various observation modes such as BF, DF, DIC, and polarizing.

BX3M-LEDR

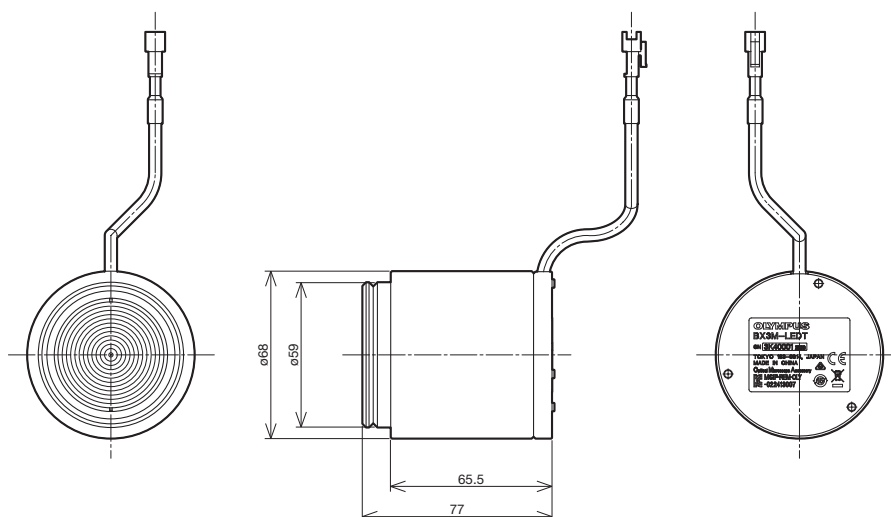
LED Lamp Housing for BX3M Reflected



Weight: 0.5 kg

BX3M-LEDT

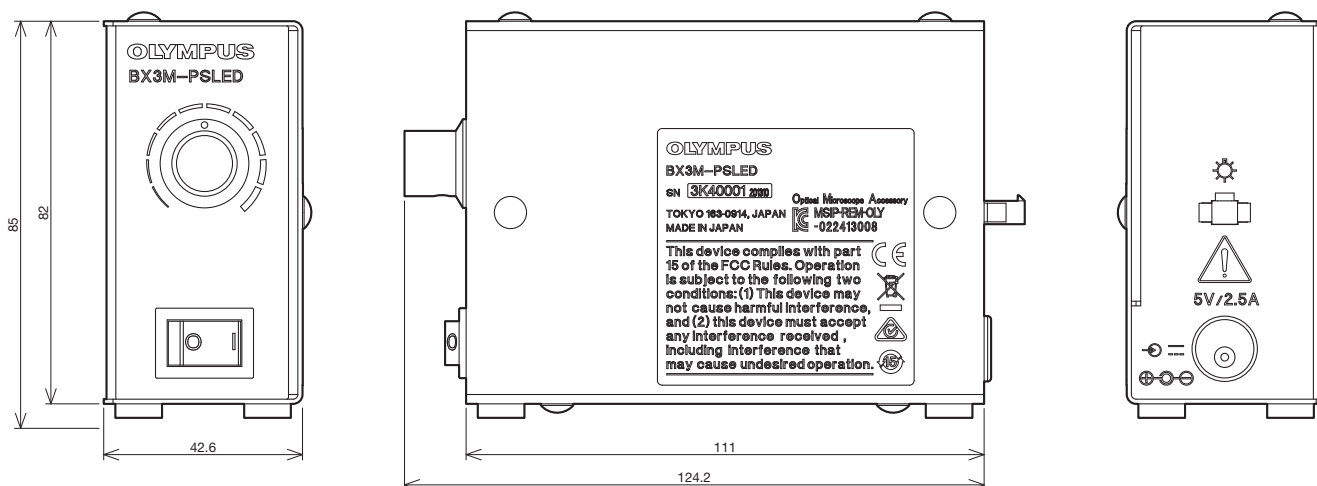
LED Lamp Housing for BX3M Transmitted



Weight: 0.5 kg

BX3M-PSLED

Power Supply for LED Lamp House (required with the BXFM)



Weight: 0.36 kg

Unit: mm

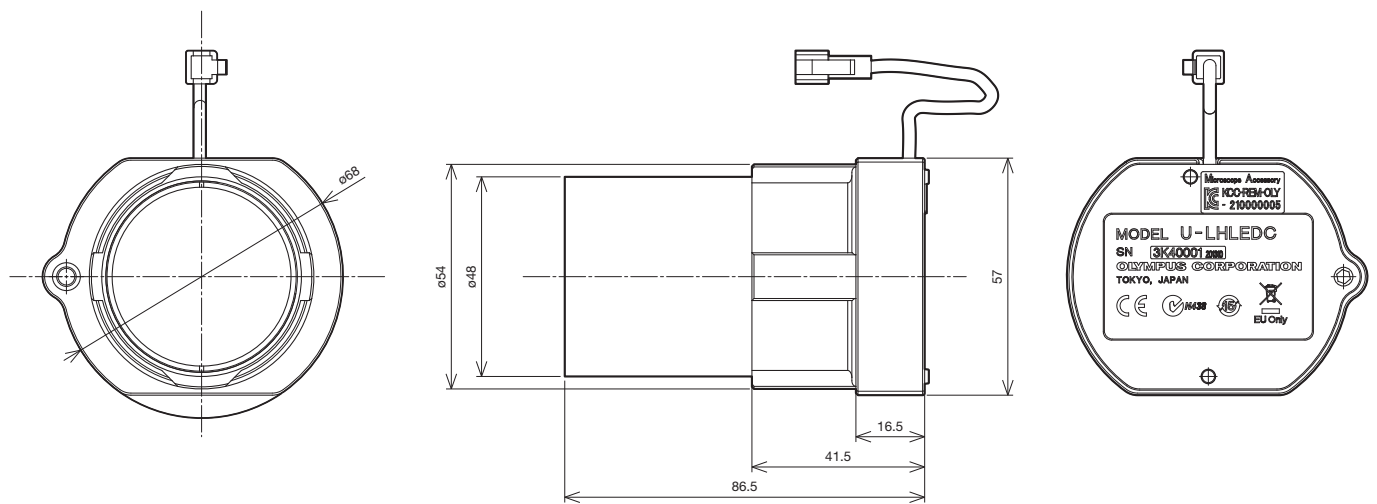
Light Source Units

LED Lamp Housing for the BX3 Series

The BX3M microscope utilizes a high-intensity white LED light source for both reflected and transmitted light. High-intensity light support various observation modes such as BF, DF, DIC, and polarizing.

U-LHLEDC

LED Lamp Housing for BX3M Transmitted

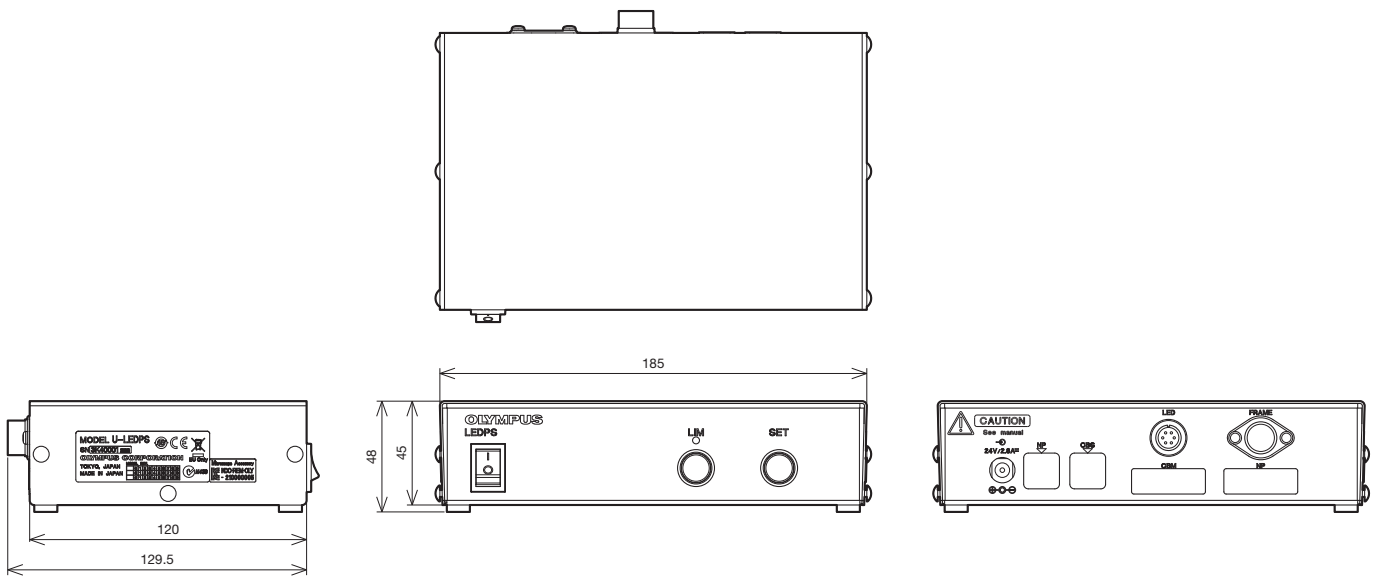


Weight: 0.5 kg

U-LEDPS

External Power Supply for U-LHLEDC

The BX3 utilizes LED illumination that provides true color reproduction and an optimized color temperature, enabling consistent color reproduction for brightfield stains.



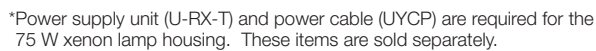
Weight: 0.78 kg

Unit: mm

Lamp Housings

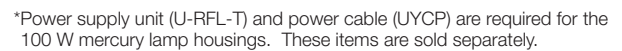
For customers who use these units in a production line, please consult your nearest Olympus representative to discuss your specific needs.

75 W Xenon Apo Lamp Housing



100 W Mercury Apo Lamp Housing

100 W Mercury Lamp Housing



Power Supply Unit for Mercury Lamp

Power Supply Unit for Xenon Lamp



6-3

Light Source Units

Halogen Illumination

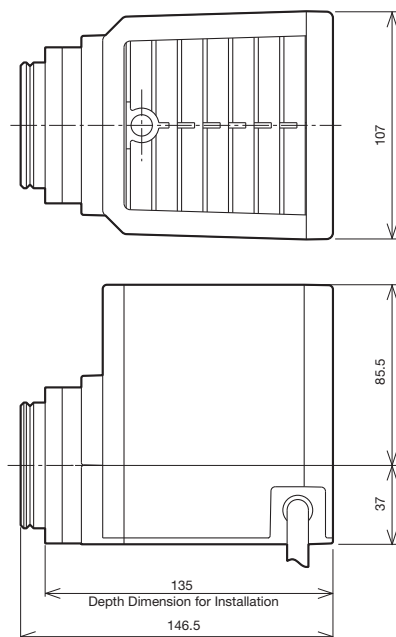
The external power supply for the 100 W halogen lamp (TH4-100/200) features an intensity adjustment knob and an on/off switch, both located close to the operator's hand for splendid comfort.

For customers who use these units in a production line, please consult your nearest Olympus representative to discuss your specific needs.

Illumination devices for microscopes have suggested lifetimes. Periodic inspections are required. Please visit our website for details.

U-LH100-3/U-LH100IR/U-LH100L-3

100 W Halogen Lamp Housings



Cable Length U-LH100-3: 290 mm
U-LH100IR: 290 mm
U-LH100L-3: 800 mm

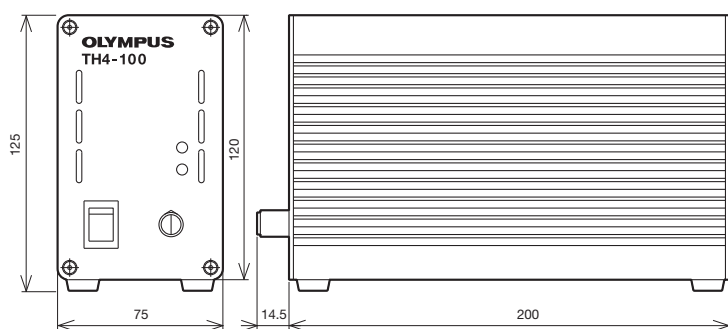
Accepted Lamp: 12V100WHAL (high-intensity lamp)
12V100WHAL-L (long-life lamp)

*External power supply (TH4-100 or TH4-200) and power cable (UYCP) are required for 100 W halogen lamp housings. These items are sold separately.

Weight: 880 g

TH4-100/200

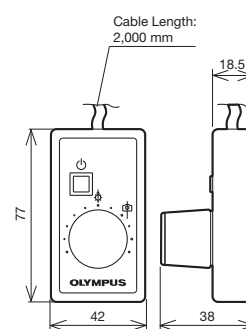
External Power Supply



Weight: 2.2 kg

TH4-HS

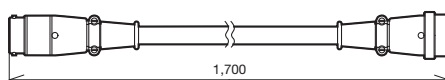
Hand Switch



Weight: 140 g

U-RMT

Extension Cord



Weight: 200 g

Unit: mm

Light Source Units

Halogen Fiber Illumination Accessories

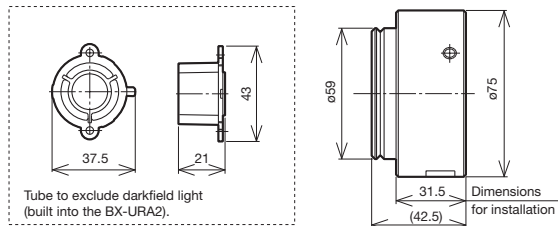
All Olympus reflected light illuminators can be used with fiber illumination.

For customers who use these units in a production line, please consult your nearest Olympus representative to discuss your specific needs.

Illumination devices for microscopes have suggested lifetimes. Periodic inspections are required. Please visit our website for details.

U-RCV

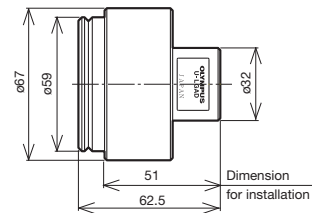
DF Converter for BX-URA2



Weight: 315 g

U-LGAD

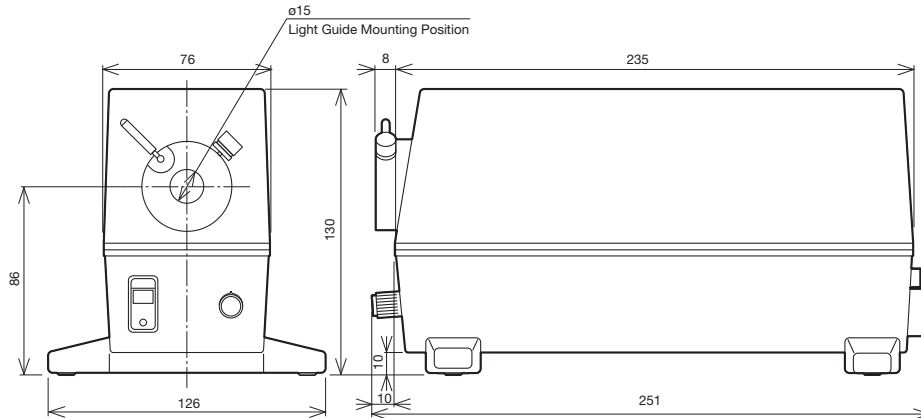
Fiber Adaptor for Reflected Light Observation



Light Guide Mount Hole $\phi 12$; Weight: 390 g

LG-PS2*

Light Source

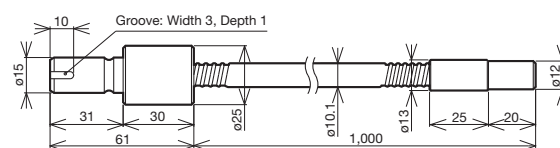


*The types of models in use varies by country.

Weight: 1.6 kg

LG-SF

Light Guide



Weight: 210 g

Unit: mm

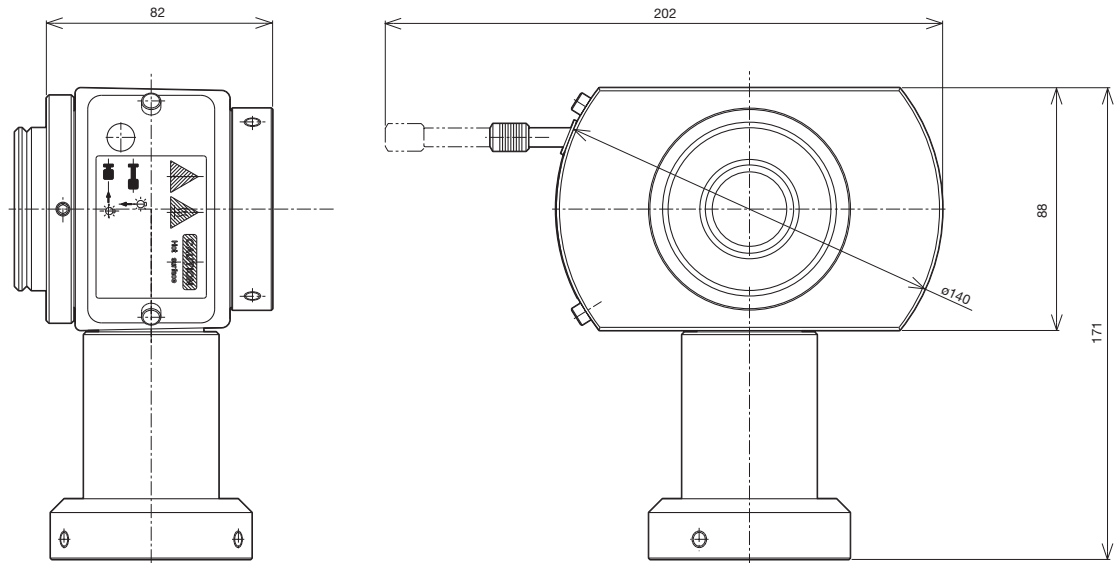
Light Source Units

Lamp Housing Accessory

Two lamp housings can be attached simultaneously.

For customers who use these units in a production line, please consult your nearest Olympus representative to discuss your specific needs.

U-DULHA
Double Lamp House Adaptor



Weight: 1.2 kg

Unit: mm

Condenser Units

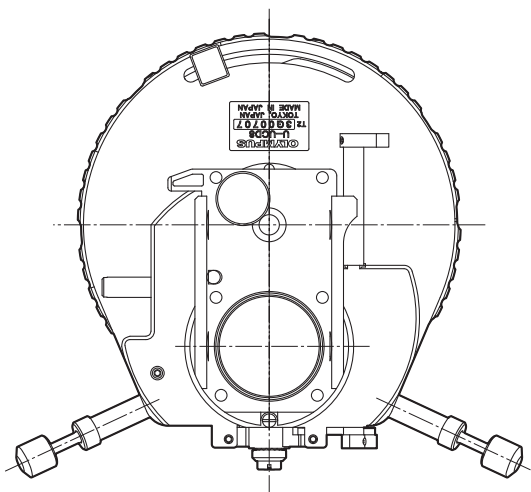
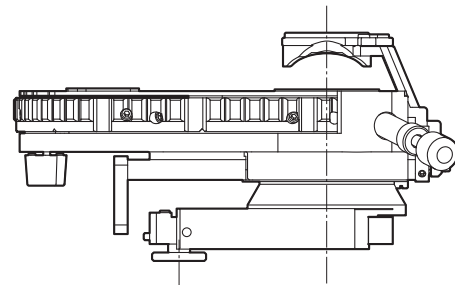
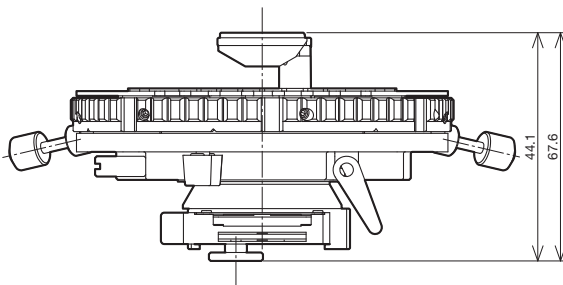
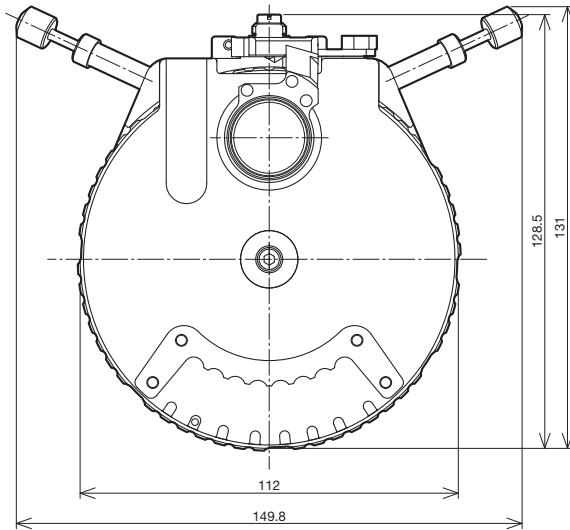
Universal Condenser

U-UCD8-2

The universal condenser contains 8 optical element slots.

*Optical elements are required. Please consult your local Olympus representative for information about different optical element combinations.

U-UCD8-2



Weight: 700 g

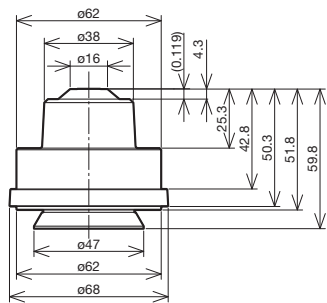
Unit: mm

Condenser Units

Condenser

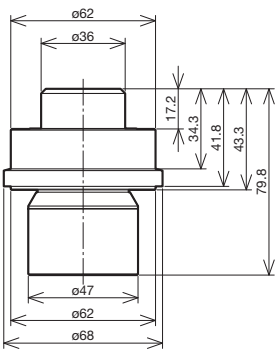
Condensers for different applications: brightfield, darkfield, and long working distance.

U-AC2-7
Abbe Condenser



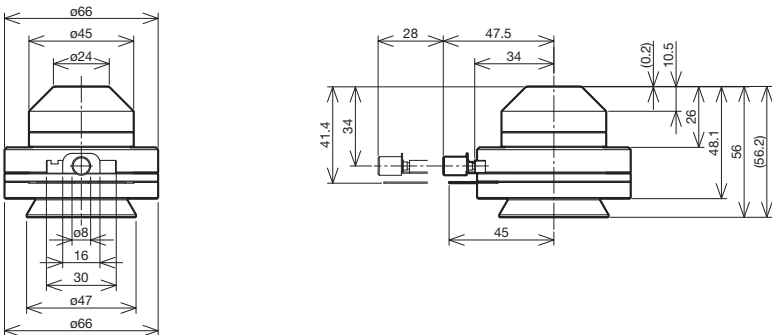
Weight: 174 g

U-LWCD
Long Working Distance Condenser



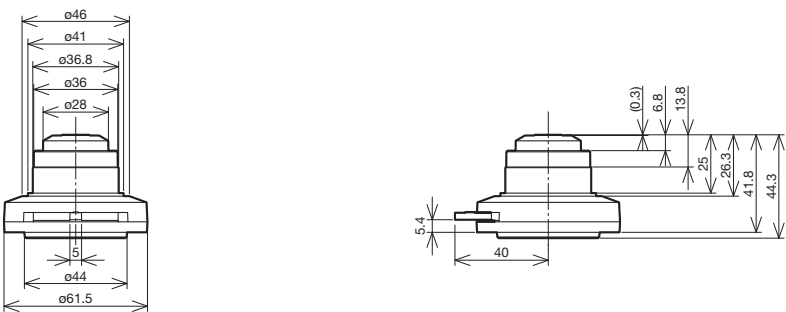
Weight: 380 g

WI-OB
Long Working Distance Oblique Condenser



Weight: 530 g

CH3-CD
Brightfield Condenser



Weight: 60 g

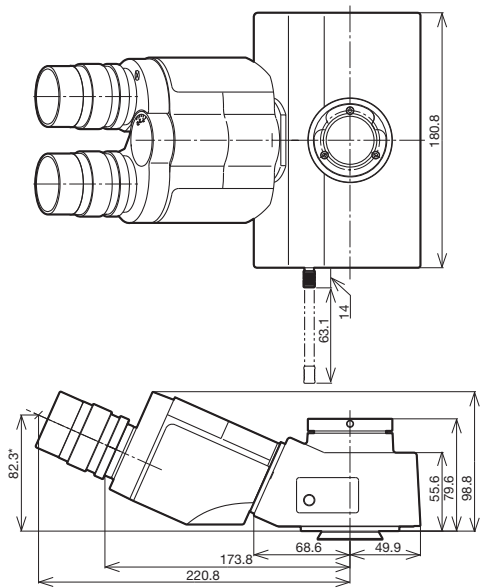
Unit: mm

Observation Tubes

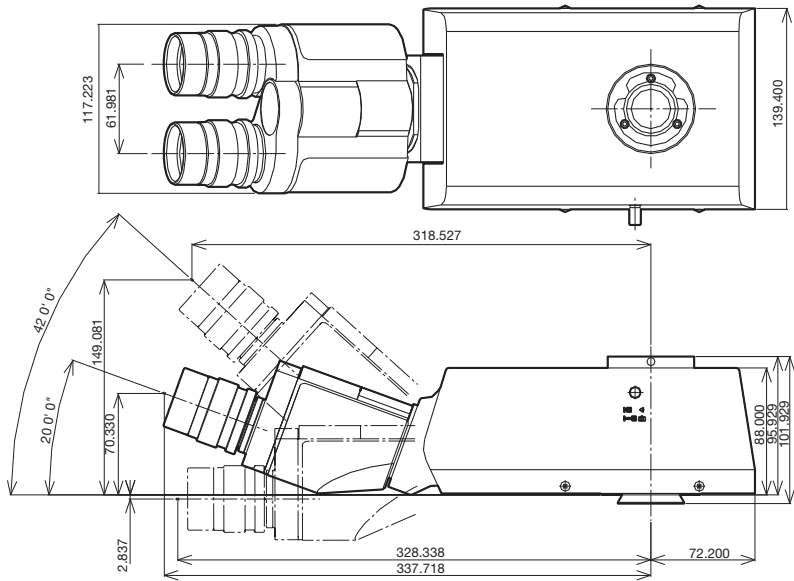
Super Widefield Trinocular Observation Tubes

Trinocular observation tubes with a super-wide field of view. These tubes are compatible with objectives up to FN 26.5.

U-SWTR-3
Super Widefield Trinocular Tube



MX-SWETTR
Super Widefield Erect Image Tilting Trinocular Tube



Unit: mm

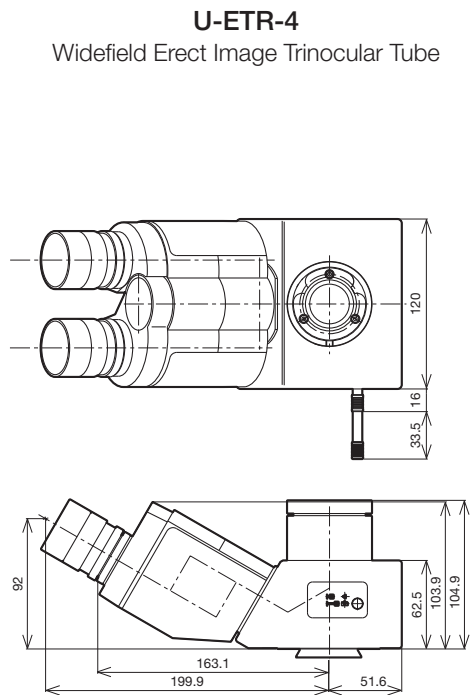
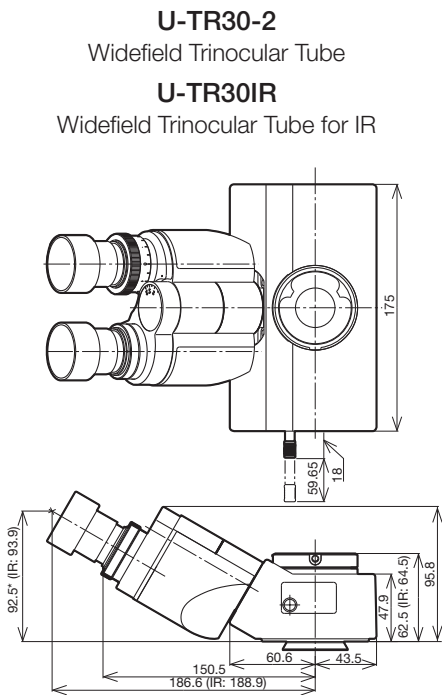
Name	FN	Inclination Angle (degrees)	Interpupillary Distance (mm)	Light Path Selector (eyepiece/video port)	Observation Image	Weight (g)
U-SWTR-3	26.5	24	50–76	100/0, 20/80, 0/100	Inverted	2300
MX-SWETTR	26.5	0–42	50–76	100/0, 0/100	Erect	4200

Length marked with an asterisk () may vary according to interpupillary distance. The distance for the figure shown is 62 mm.

Observation Tubes

Widefield Trinocular Observation Tubes

Trinocular observation tubes with wide field of view. These tubes are compatible with objectives up to FN 26.5.



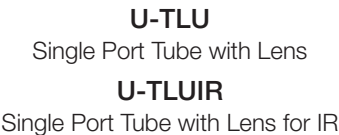
Unit: mm

Name	FN	Inclination Angle (degrees)	Interpupillary Distance (mm)	Light Path Selector (eyepiece/video port)	Observation Image	Weight (g)
U-TR30-2	22	30	50–76	100/0, 20/80, 0/100	Inverted	1600
U-TR30IR	22	30	50–76	100/0, 0/100	Inverted	1600
U-ETR-4	22	30	50–76	100/0, 0/100	Erect	1900

Length marked with an asterisk () may vary according to interpupillary distance. The distance for the figure shown is 62 mm.

Single Port Tube with Lens

When visual observation is not needed and only video observation is required, a single port tube with a built-in telan lens can be attached directly to the video port.



• For attachable video camera adaptors, refer to the video camera adaptors system diagram (pages 2-12 and 2-13).

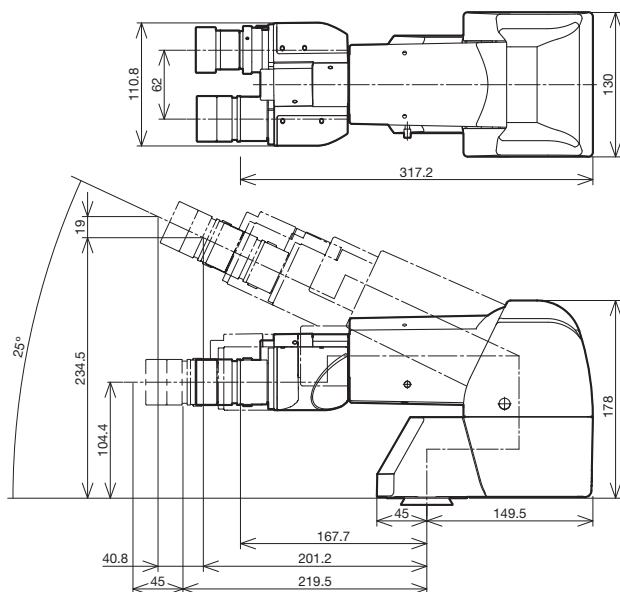
Weight: 350 g Unit: mm

Observation Tubes

Tilting Binocular Tube

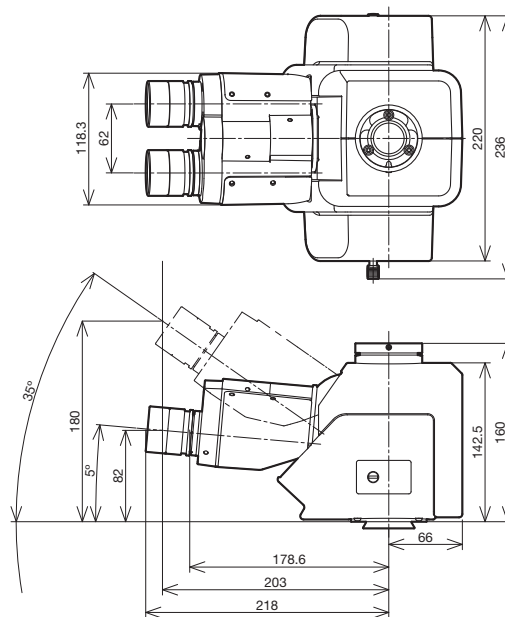
U-TTBI

Telescopic Tilting Binocular Tube



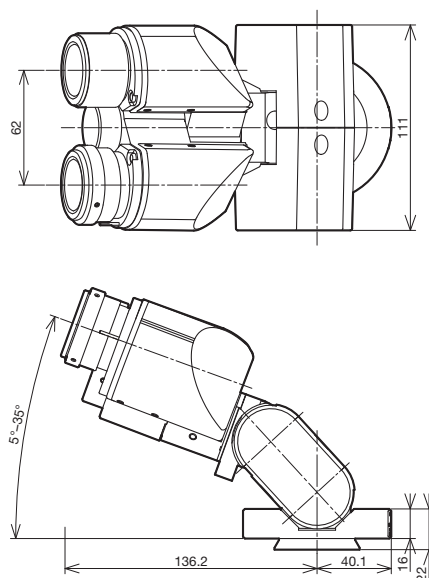
U-TTR-2

Tilting Trinocular Tube



U-TBI-3

Tilting Binocular Tube



Unit: mm

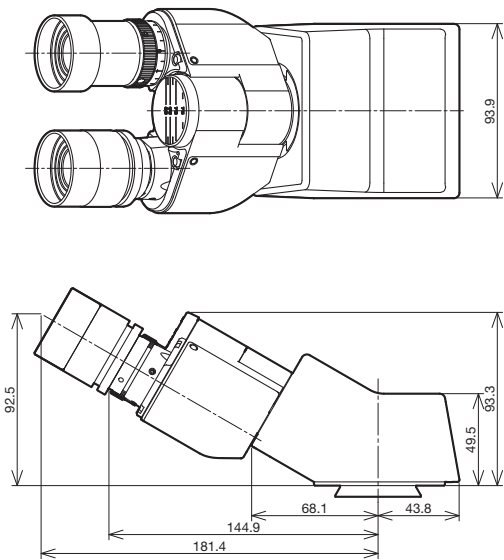
Name	FN	Inclination Angle (degrees)	Interpupillary Distance (mm)	Light Path Selector (eyepiece/video port)	Observation Image	Weight (g)
U-TTBI	22	0-25	50-76	NA	Inverted	3800
U-TTR-2	22	5-35	50-76	100/0, 0/100, 50/50	Inverted	3200
U-TBI-3	22	5-35	50-76	NA	Inverted	1300

*When combined with the CX-RFA-2, the field number is reduced to 18.

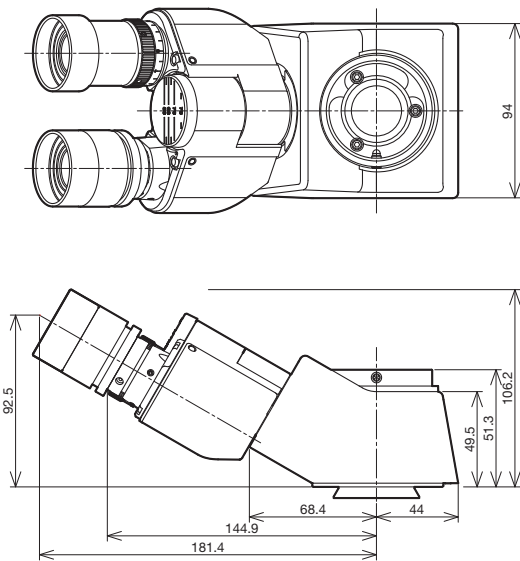
Observation Tubes

Binocular Tube

U-CBI30-2
Binocular Tube



U-CTR30-2
Trinocular Tube



Unit: mm

Name	FN	Inclination Angle (degrees)	Interpupillary Distance (mm)	Light Path Selector (eyepiece/video port)	Observation Image	Weight (g)
U-CBI30-2	20, 18(*)	30	48-75	NA	Inverted	800
U-CTR30-2	20, 18(*)	30	48-75	NA	Inverted	900

*When combined with the CX-RFA-2, the field number is reduced to 18.

Intermediate Tubes and Accessories

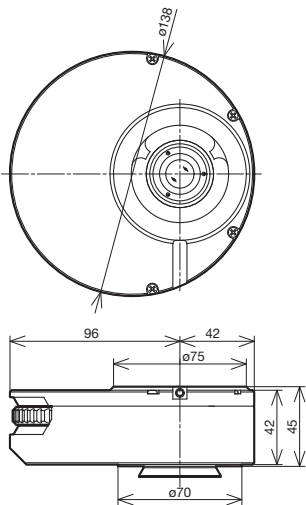
Intermediate Tubes

Olympus makes various accessories to satisfy a wide variety of observation needs.

U-CA

Magnification Changer

Provides 1X, 1.2X, 1.6X, and 2X intermediate magnifications.



Weight: 1.3 kg

U-ECA

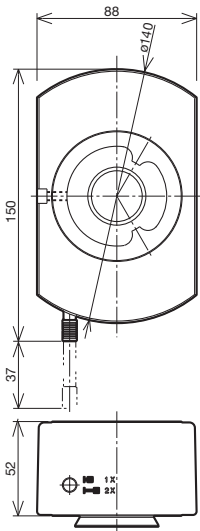
Magnification Changer 2C

Provides 1X and 2X intermediate magnifications.

U-ECA1.6X

Magnification Changer 1.6X

Provides 1X and 1.6X intermediate magnifications.

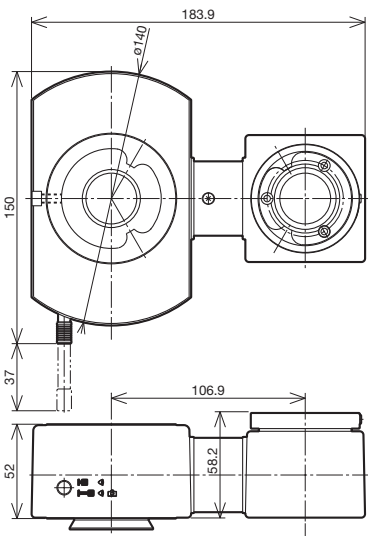


Weight: 1.3 kg

U-TRU

Trinocular Intermediate Attachment

The intermediate attachment divides the light path, enabling users to attach both digital and video cameras.



BI:PT=100:0/20:80

Weight: 1.3 kg

Unit: mm

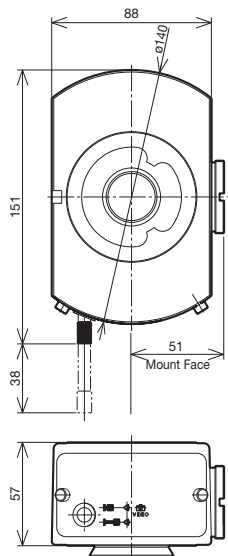
Intermediate Tubes and Accessories

Intermediate Tubes

Olympus makes various accessories to satisfy a wide variety of observation needs.

U-DP Dual Port

Use this intermediate tube to divide the light path.



Weight: 1 kg

Light path selector via mirror unit

-  Transmitted Side Port: Side Port = 100:0
-  Transmitted Side Port: Side Port = 70:30 (with use of U-MBF3)

U-DP1XC Dual Port 1X

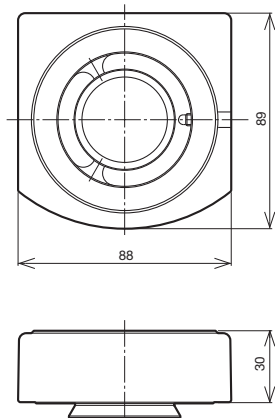
Combine this component with the U-DP to obtain a 1X image.



Weight: 500 g

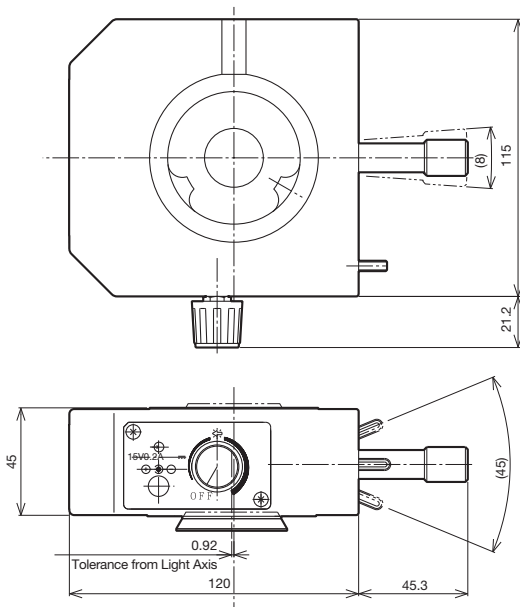
U-EPA2 Eyepoint Adjuster

This component raises the eyepoint by 30 mm.



Weight: Approximately 500 g

U-APT Arrow Pointer



Weight: 1.2 kg

Unit: mm

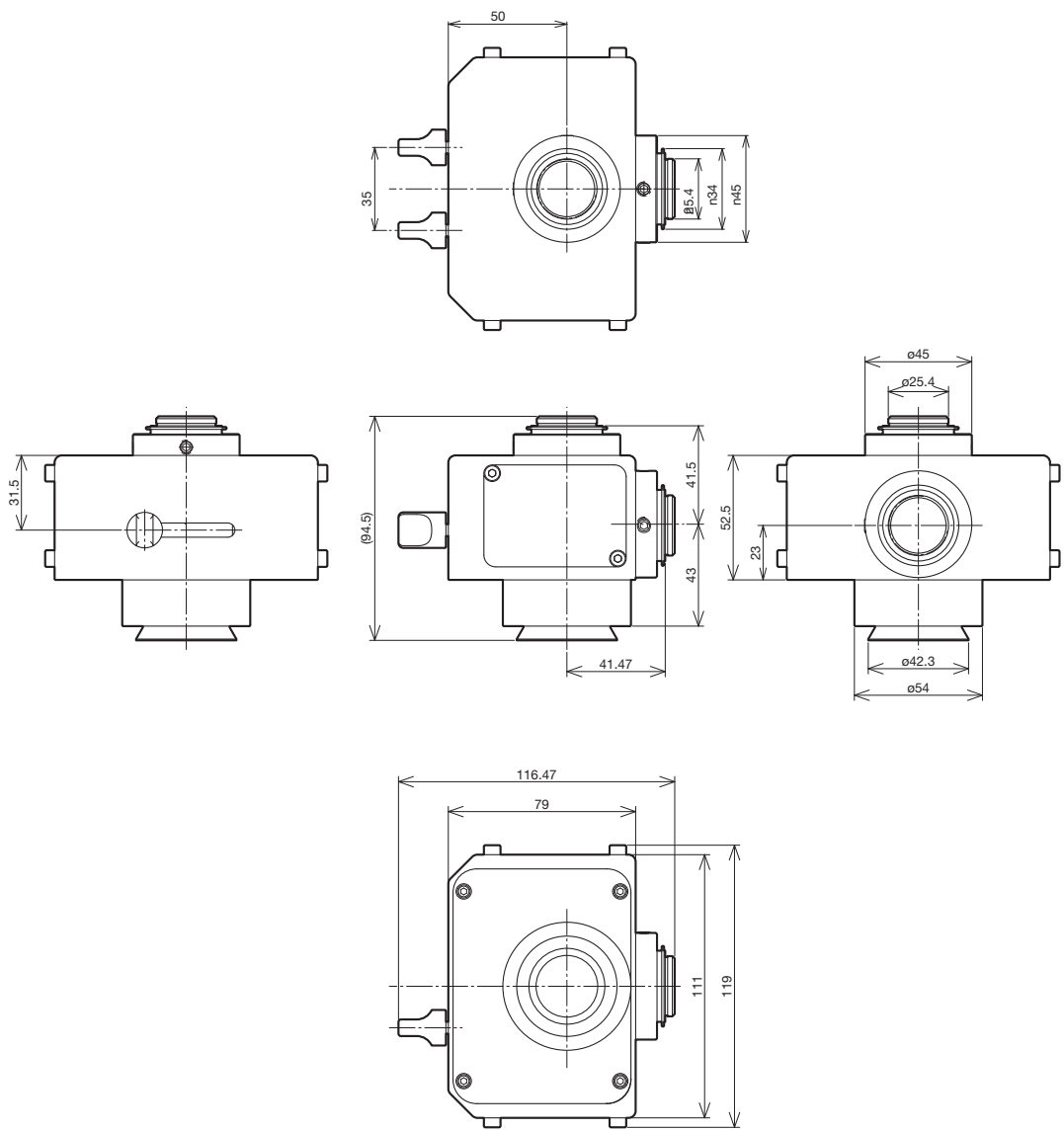
Intermediate Tubes and Accessories

Dual port tube with C-mounts

U-DPCAD

The dual camera port enables the user to attach two cameras.

U-DPCAD



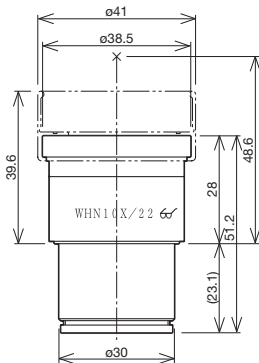
Weight: 0.9 kg Unit: mm

Eyepieces

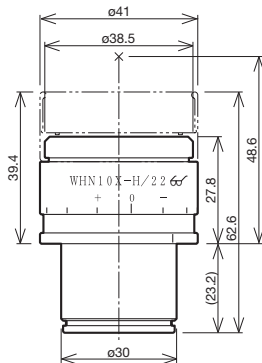
Eyepieces

Eyepieces for the UIS2 optical system.

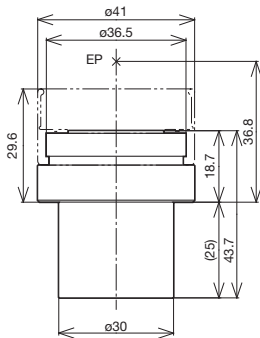
WHN10X
Widefield Eyepiece



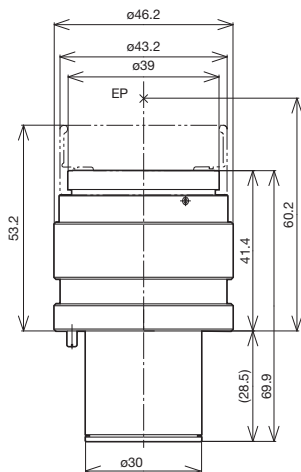
WHN10X-H
CROSSWHN10X
Widefield Eyepieces



WH15X
Widefield Eyepiece



SWH10X-H
MICROSSWH10X
CROSSSWH10X
Super Widefield Eyepieces



unit: mm

Name	FN	Diopter Adjustment Range (1/m)	Micrometer Diameter (mm)	Weight (g)	Remarks
WHN10X	22	—	24	90	
WHN10X-H	22	-8→+5	24	170	With adjustable diopter
CROSSWHN10X	22	-8→+5	—	170	With cross lines and adjustable diopter
WH15X	14	—	24	90	
SWH10X-H	26.5	-8→+2	—	210	With adjustable diopter
MICROSSWH10X	26.5	-8→+2	—	210	With micrometer and adjustable diopter
CROSSSWH10X	26.5	-8→+2	—	210	With cross lines and adjustable diopter

*EP=eyepoint

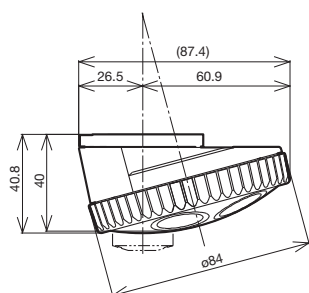
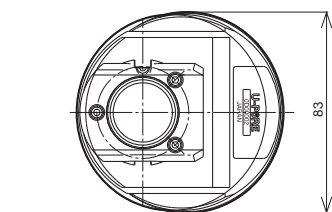
Revolving Nosepieces

Revolving Nosepieces for BF Objectives

Users can choose from the 6 revolving nosepieces for BF objectives shown below. For motorized nosepieces, please refer to the motorized unit page.

U-5RE-2

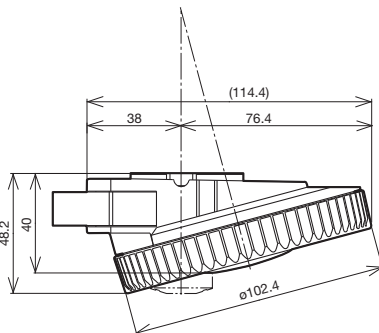
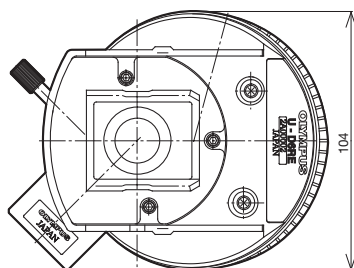
Quintuple Revolving Nosepiece



Weight: 520 g

U-D6RE

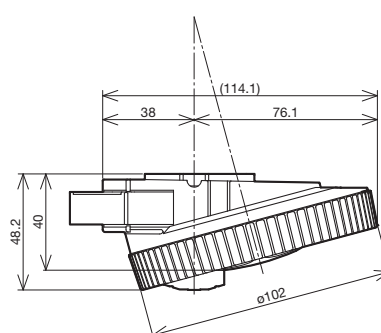
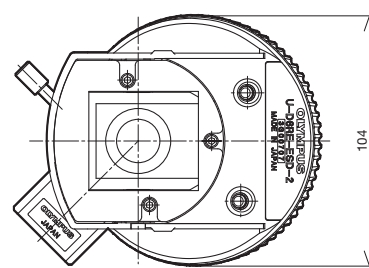
Septuple Revolving Nosepiece with Slider Slot for DIC



Weight: 800 g

U-D6RE-ESD

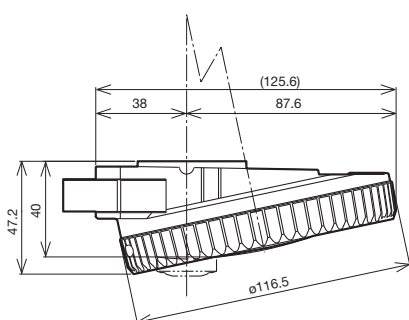
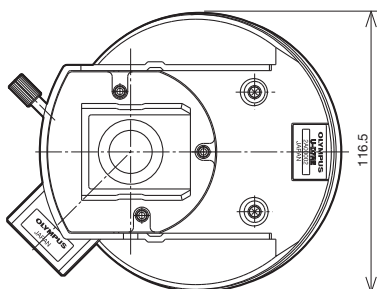
ESD-Resistant Sextuple Revolving Nosepiece with Slider Slot for DIC



Weight: 0.7 kg

U-D7RE

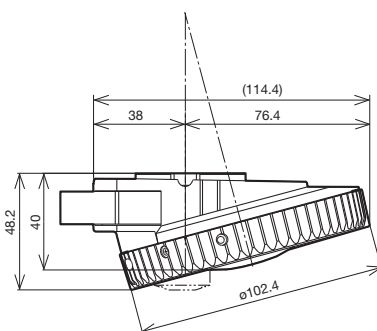
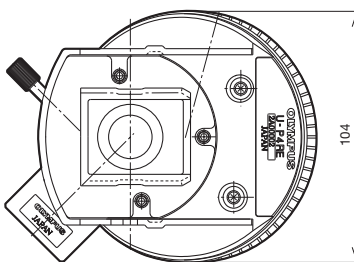
Sextuple Revolving Nosepiece with Slider Slot for DIC



Weight: 980 g

U-P4RE

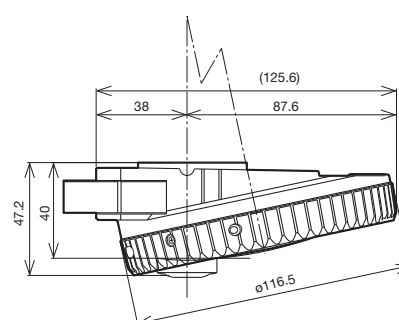
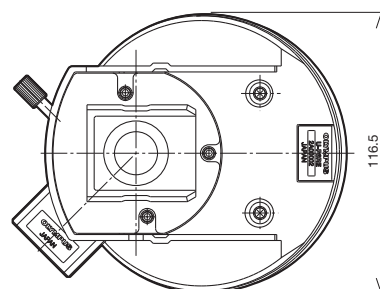
Centerable Quadruple Revolving Nosepiece with Slider Slot for DIC



Weight: 1 kg

U-P6RE

Centerable Sextuple Revolving Nosepiece with Slider Slot for DIC



Weight: 1 kg

Insert the DIC dummy when not using the DIC slider. unit: mm

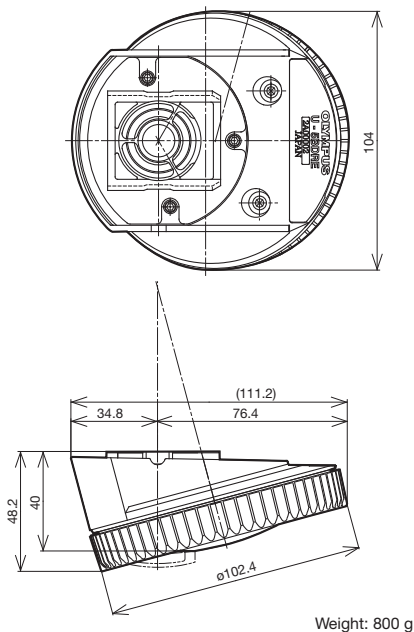
Revolving Nosepieces

Revolving Nosepieces for BF/DF Objectives

Users can choose from the following 3 types of revolving nosepieces for BF/DF objectives. To attach brightfield objectives, users must use the BF adaptor (BD-M-AD). For motorized nosepieces, please refer to the motorized unit page.

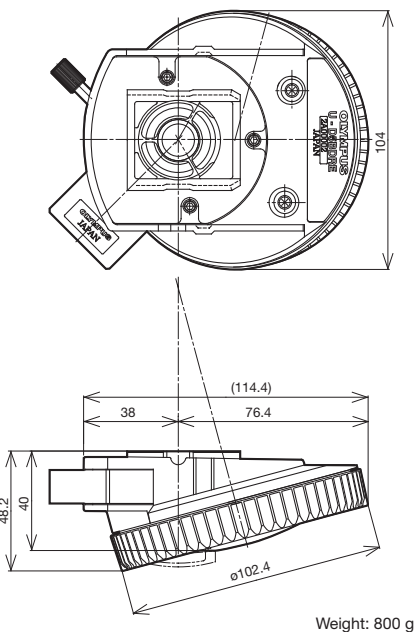
U-5BDRE

Quintuple Revolving Nosepiece for BF/DF



U-D5BDRE

Quintuple Revolving Nosepiece for BF/DF with Slider Slot for DIC

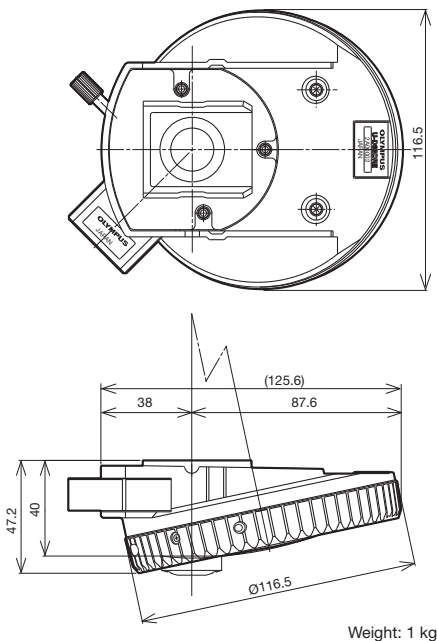


U-P5BDRE

Centerable Quintuple Revolving Nosepiece with Slider Slot for DIC

U-D6BDRE

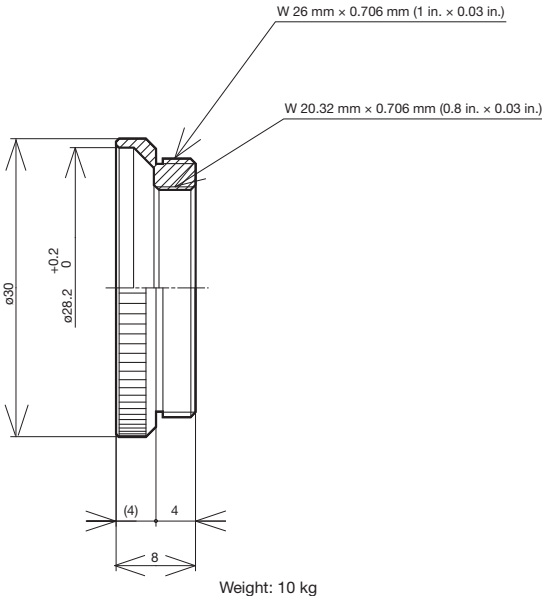
Sextuple Revolving Nosepiece for BF/DF with Slider Slot for DIC



Insert the DIC dummy when not using the DIC slider.

BD-M-AD

Adaptor to Mount BF Objectives



Weight: 10 kg

unit: mm

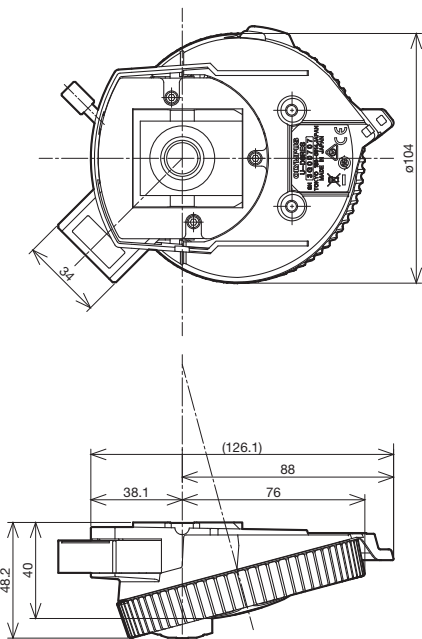
Revolving Nosepieces

Coded Sextuple Revolving Nosepiece

Coded nosepieces for BF, DF, and DIC applications.

U-D6RES

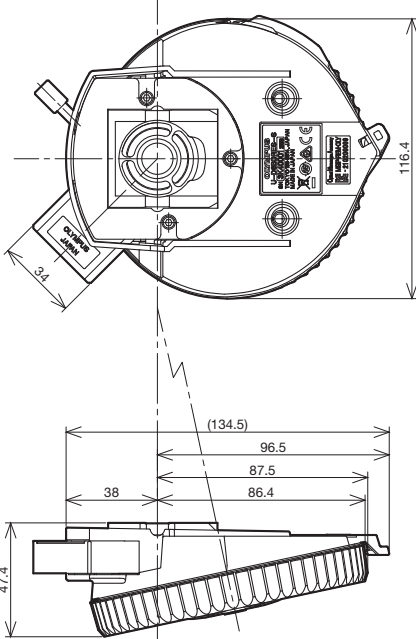
Coded Sextuple Revolving Nosepiece
with Slider Slot for DIC



Weight: 0.7 kg

U-D6BDRES-S

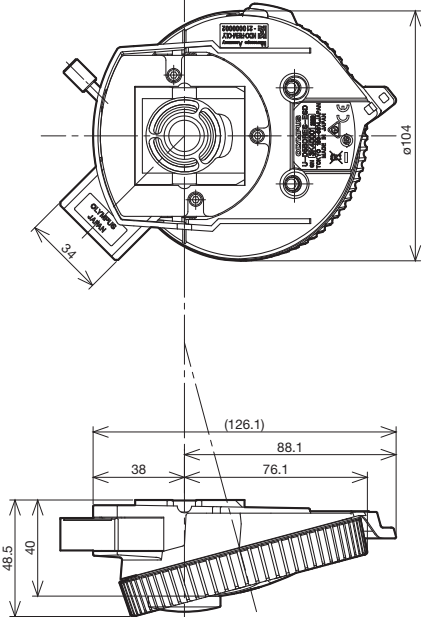
Coded Sextuple BF/DF Revolving
Nosepiece with Slider Slot for DIC



Weight: 0.9 kg

U-D5BDRES-ESD

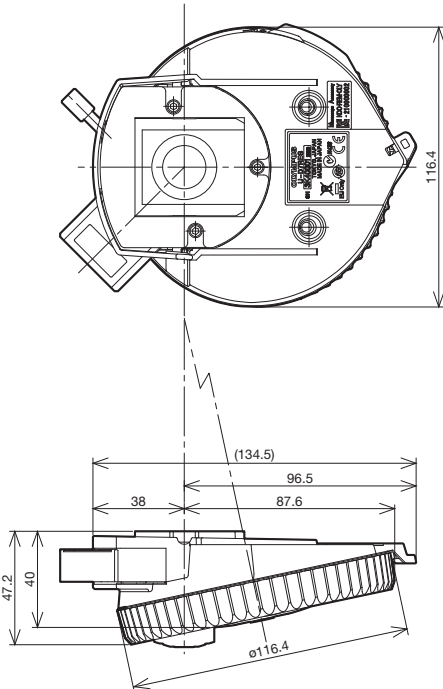
ESD-Resistant Coded Quintuple BF/DF
Revolving Nosepiece with Slider Slot for
DIC



Weight: 0.75 kg

U-D7RES

Coded Septuple Nosepiece with Slider Slot for DIC



unit: mm

C-Mount Video Camera Ports

U-TV0.25XC

U-TV0.35XC-2

U-TV0.5XC-3

U-TV0.63XC

U-TV1XC

Technical drawing of the Olympus 1-210 camera. The drawing shows the camera body with various dimensions indicated. The total height is 94.5. The height from the base to the top of the lens assembly is 84.5. The height of the lens assembly is 4. The height of the viewfinder is 17.5. The diameter of the base is $\phi 66.5$. The image plane is indicated by a dashed line and an 'x' mark.

Field of View (FN)

2/3" CCD

1/2" CCD

Projection Area

$$\text{Practical Field of View (mm)} = \frac{\text{Projection Area (FN)}}{\text{Objective Magnification}}$$

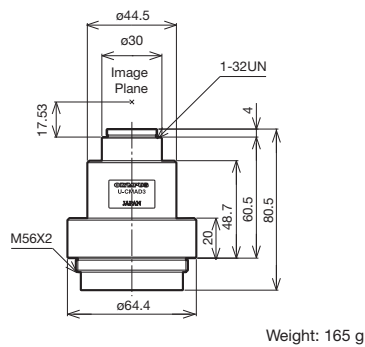
12-1

Video Camera Adaptors

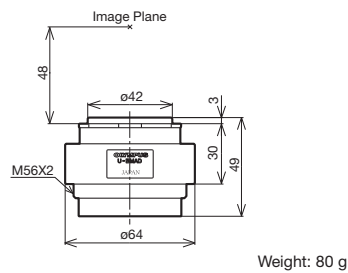
Video Camera Mount Adaptors

These video camera mount adaptors enable users to attach cameras with C, bayonet, Sony, and F-mounts. Use these adaptors with the U-TV1X-2. Focus by amount of screwing into U-TV1X-2.

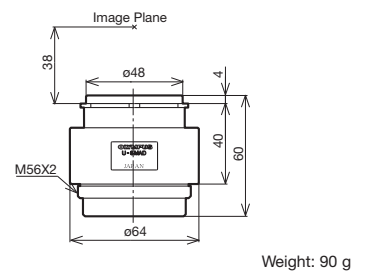
U-CMAD3
C-Mount Adaptor



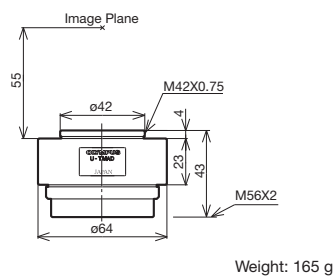
U-BMAD
Bayonet Mount Adaptor



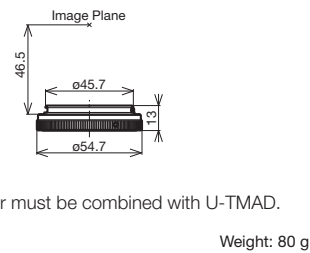
U-SMAD
Sony Mount Adaptor



U-TMAD
T-Mount Adaptor



U-FMT
F/T-Mount Adaptor *

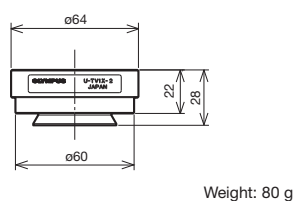


*This adaptor must be combined with U-TMAD.

Video Camera Port

This port can be attached directly to the trinocular observation tube as well as to the single port tube with lens.

U-TV1X-2
Video Port 1X



Unit: mm

Motorized Units

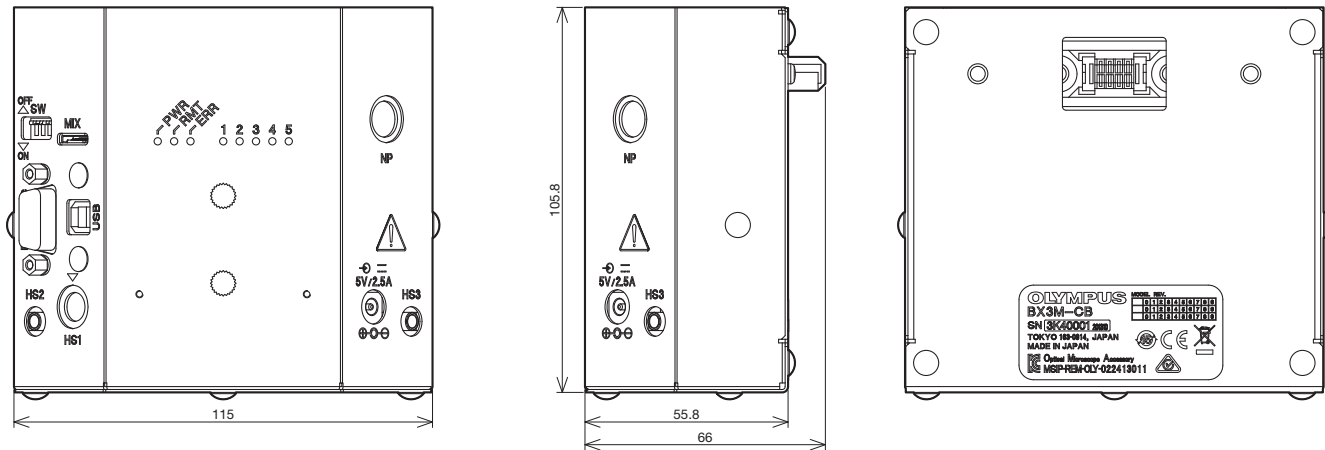
Control Box for the BX53M/BXFM Microscope

BX3M-CB

Control Box for the BXFM Microscope

The control box can be connected to a PC using an RS232 or USB2.0 cable (attached to the microscope frame).

*Please consult your local Olympus representative for detailed system configuration and combination information.



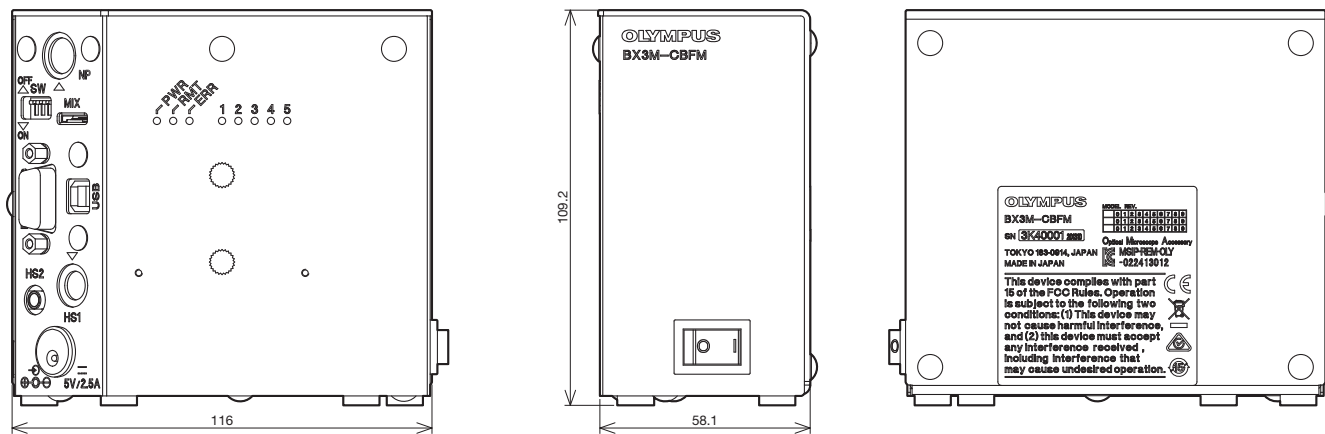
Weight: 0.49 kg

BX3M-CBFM

Control Box for the BX53M Frame

The control box can be connected to a PC using an RS232 or USB2.0 cable (attached to the microscope frame).

*Please consult your local Olympus representative for detailed system configuration and combination information.



Weight: 0.67 kg

Motorized Units

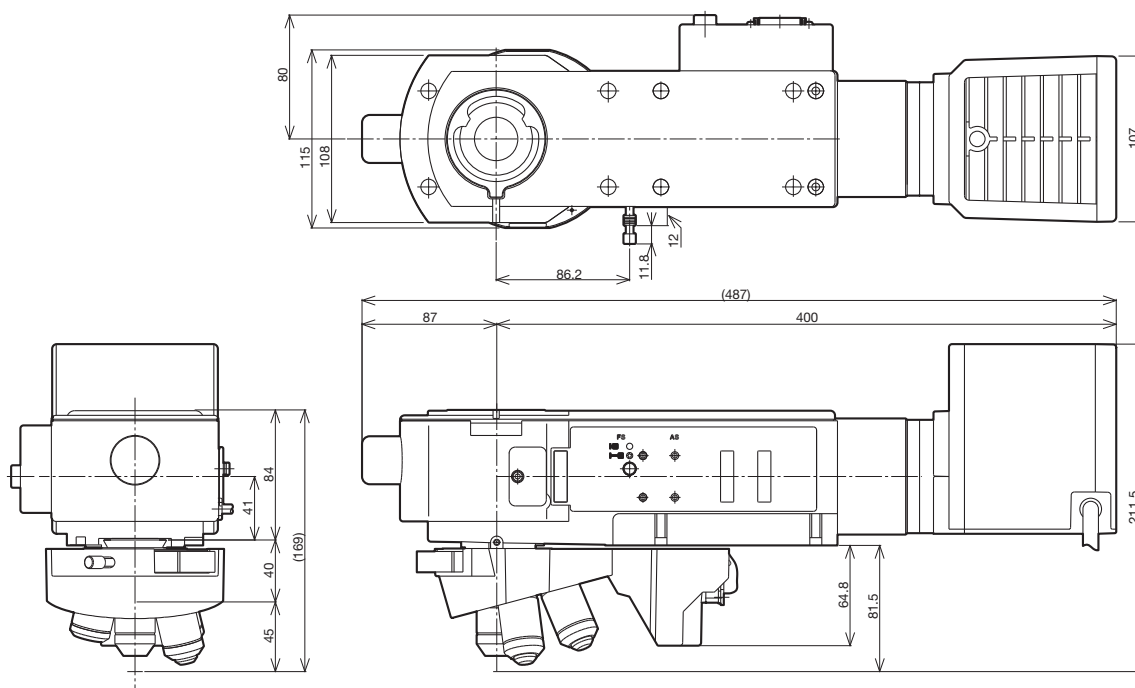
Motorized Universal Reflected Illuminator for the BX2 Series

These various motorized units are used to help automate equipment.

BX-RLAA + U-D6REMC + U-LH100-3

Motorized BF/DF Reflected Light Illuminator + Motorized Nomarski DIC Sextuple Revolving Nosepiece + 100 W Halogen Lamp Housing

These components motorize the exchange of objectives, the selection of brightfield and darkfield observation, and the opening and closing of the aperture diaphragm. The BX-UCB control unit has an RS232C connector, enabling control via a PC. For instructions on how to attach an illuminator, please refer to the mounting directions for the BX-RLA2.

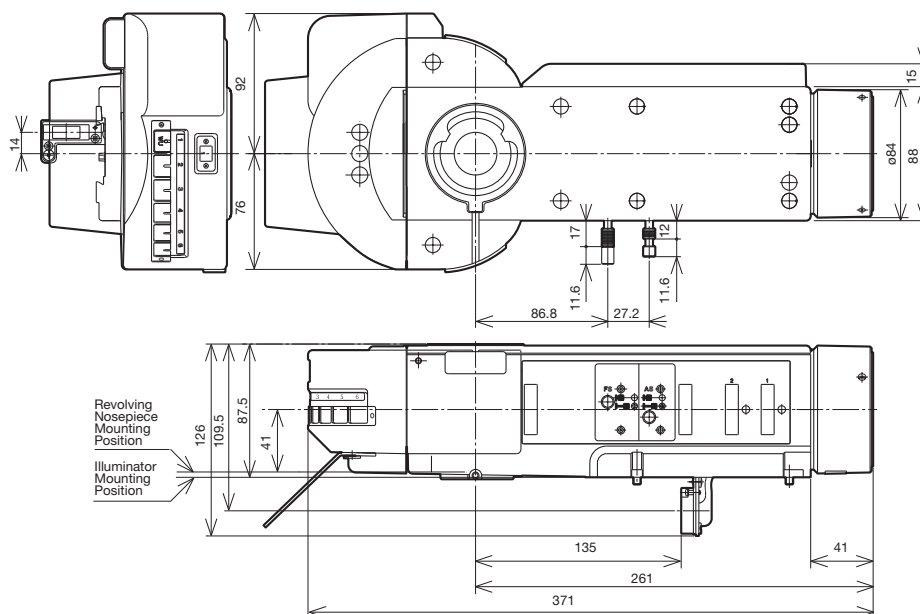


Illuminator Cable Length: 1,800 mm Weight: 5.5 kg (excludes objectives)

BX-RFAA

Motorized Universal Reflected Light Illuminator

This reflected light fluorescence illuminator enables users to simultaneously attach six mirror units and incorporates a motorized mirror unit changer and shutter.



Illuminator Cable Length: 1,800 mm Weight: 4.3 kg

Unit: mm

Motorized Units

Motorized Units

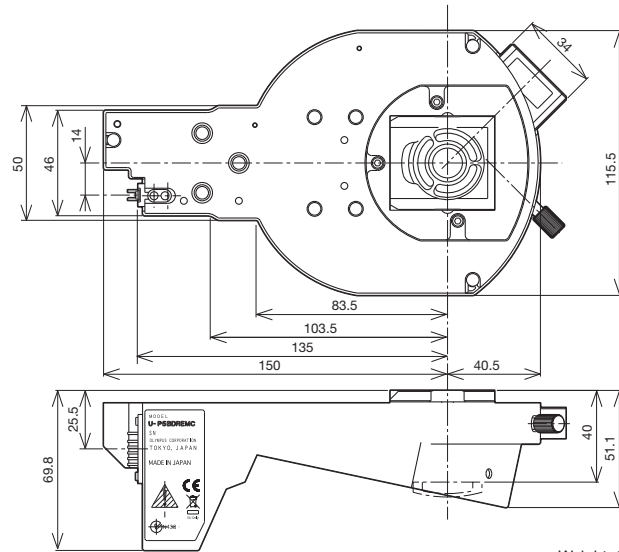
These various motorized units are used to help automate equipment.

U-P5BDREMC

Motorized Centerable Quintuple BD Revolving Nosepiece with Slider Slot for DIC

U-D6BDREMC

Motorized Sextuple BD Revolving Nosepiece with Slider Slot for DIC



Weight: 80 g

U-D5BDREMC

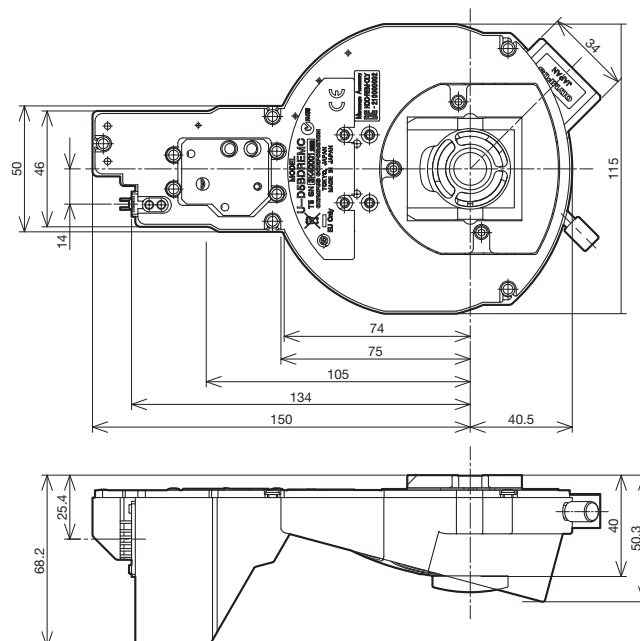
Motorized Quintuple BD Revolving Nosepiece with Slider Slot for DIC

U-D6REMC

Motorized Sextuple Revolving Nosepiece with Slider Slot for DIC

U-P5REMC

Motorized Centerable Quintuple Revolving Nosepiece with Slider Slot for DIC



Unit: mm

Motorized Units

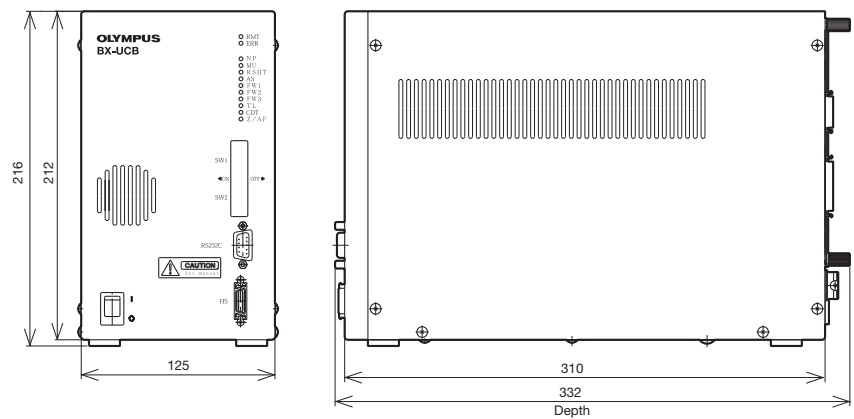
Control Box for the BX2 Series

These various motorized units are used to help automate equipment.

BX-UCB

Control Unit

Motorized units, including the motorized illuminator and auto focus unit, can be totally controlled from the BX-UCB.

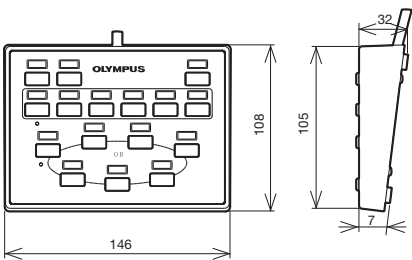


*Extension cord U-RMT (1,700 mm) should be used to connect the lamp housing (U-LH100-3) to the BX-UCB.

Weight: 1.0 kg

U-HSTR2

Hand Switch



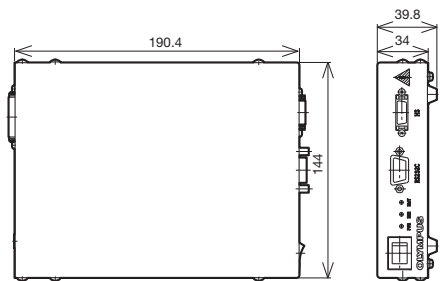
Cable Length 2,000 mm Weight: 370 g

BX-REMCB

Control Box for Motorized Nosepiece and BF/DF Illuminator

The BX-RLAA and U-D5BDREMC/U-D6REMC/U-P5REMC can be controlled from the U-HSTR2 or directly from the computer keyboard via an RS232C connector.

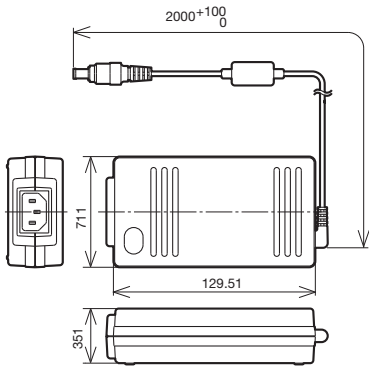
*BX-RFAA and U-D5BDREM/U-D6REM combination is not applicable.



Weight: kg

U-ACAD4515

AC Adaptor for BX-REMCB



Weight: kg

Unit: mm

Motorized Units

Motorized Units for the BX2 Series

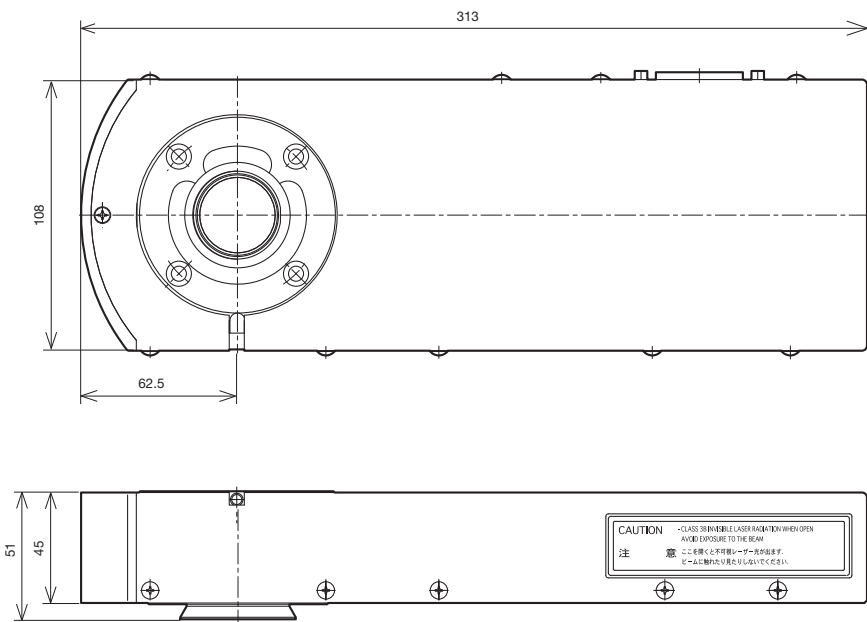
These various motorized units are used to help automate equipment.

U-AFA2M-VIS

Active Auto Focus Unit

This unit features a 785 nm auto focus laser light source. The multiple-spot sensor enables fast, stable focusing on specimens with variable height differences.

*Class 1 laser product



*Consult your local Olympus dealer about the motorized focus.

Weight: 2.6 kg

Cable

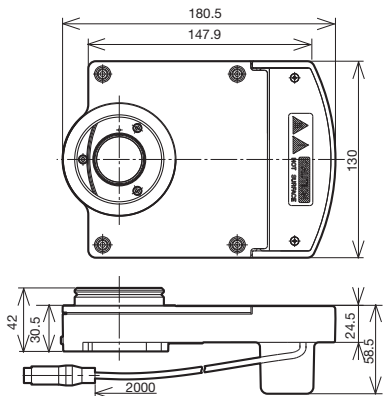
AFA2M-CBL2M Weight: 0.23 kg Length: 2 m

AFA2M-CBL3M Weight: 0.36 kg Length: 3 m

U-FWR

Motorized Reflected Filter Wheel

With this filter wheel, quickly switch between 6 different filters.



Weight: 1.0 kg

Motorized Units

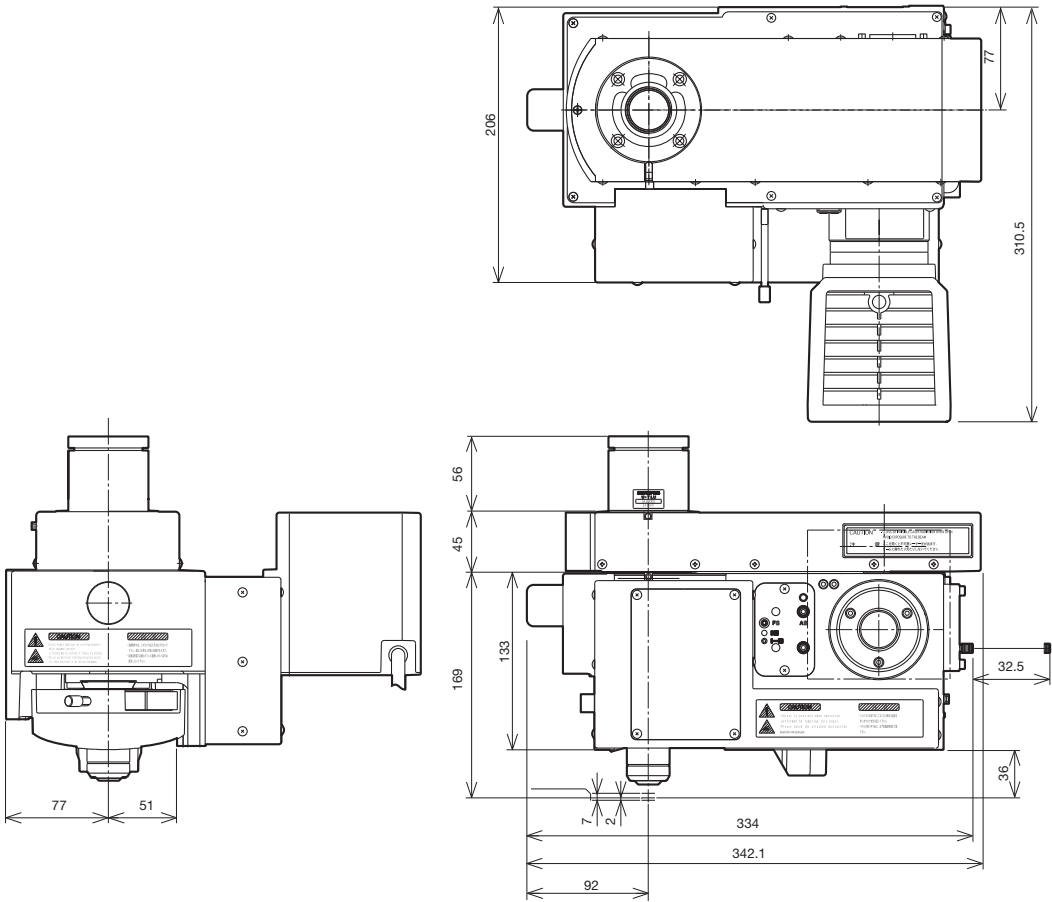
Motorized Modular Microscope

With these components, users can integrate motorized microscope units into their equipment. Motorized operations, such as moving the nosepiece up and down, changing objectives, opening and closing the aperture diaphragm, and changing between brightfield and darkfield observation modes, are made possible using these components. Several of these operations can be totally controlled from an external unit by adding an auto focus (AF) unit.

BXFMA-F

Motorized Illumination with Power Focus

This configuration combines the active auto focus unit (U-AFA2M-VIS), a single port tube with lens (U-TLU), a lamp housing, a motorized nosepiece, and objectives.

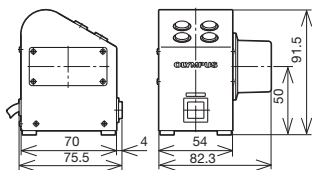


*Please consult your local Olympus representative for information about the mounting dimensions.

Weight: 13 kg (BXFMA-F frame 7.6 kg)

U-FH

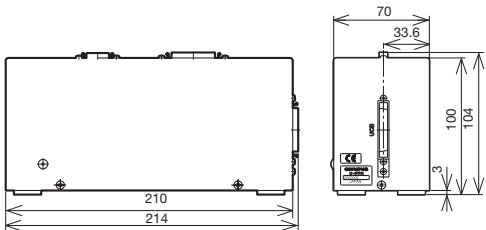
Focus Adjustment Knob Unit



Weight: 760 g

U-IFFH

Focus Adjustment Knob Interface



Weight: 1450 g

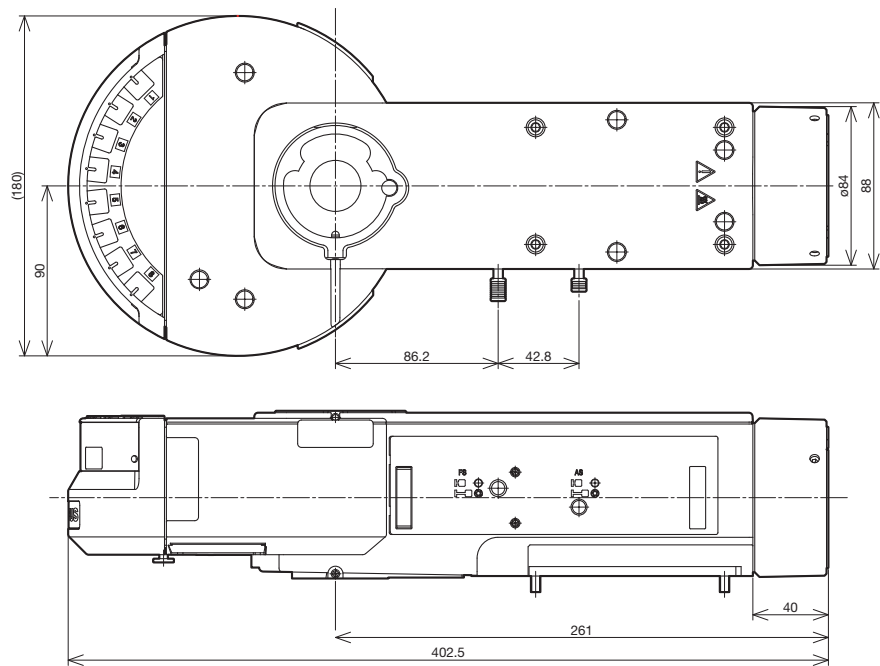
Unit: mm

Motorized Units

Motorized Units for the BX3 Series

The flexibility of the motorized fluorescence illuminator accommodates multi color stained specimens. The 8-position mirror unit permits quick changeover of fluorescence colors.

BX3-RFAA
Motorized Fluorescence Illuminator

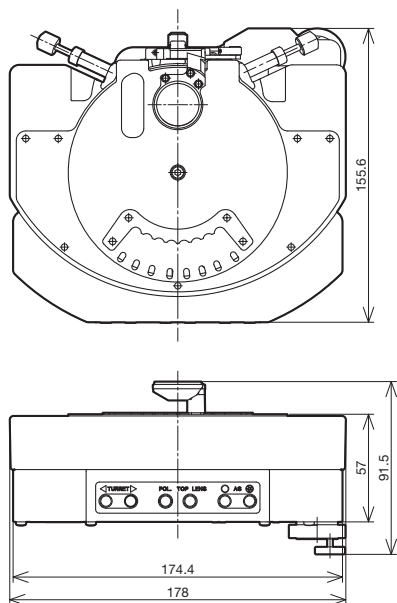


Weight: 4.2 kg

BX3-UCD8A
Motorized Universal Condenser

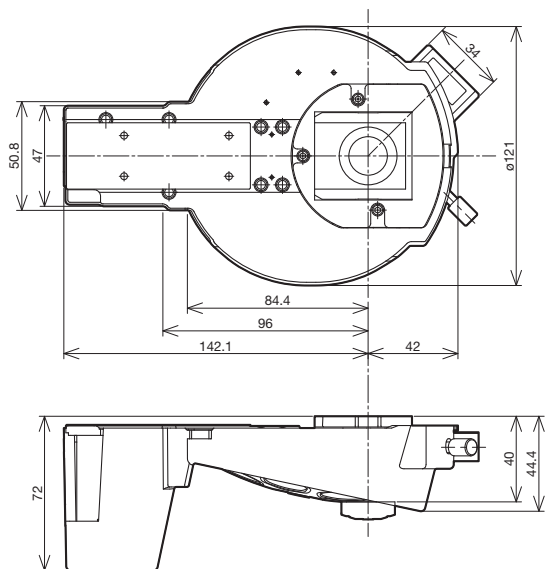
The motorized universal condenser integrates a variety of optical elements to accommodate transmitted light techniques including brightfield, DIC, and phase contrast observation.

*Optical elements are required. Please consult your local Olympus representative about optical elements combinations.



Weight: 1.6 kg

U-D7REA
Motorized Septuple Revolving Nosepiece with Slider Slot for DIC



Weight: 1.5 kg

Unit: mm

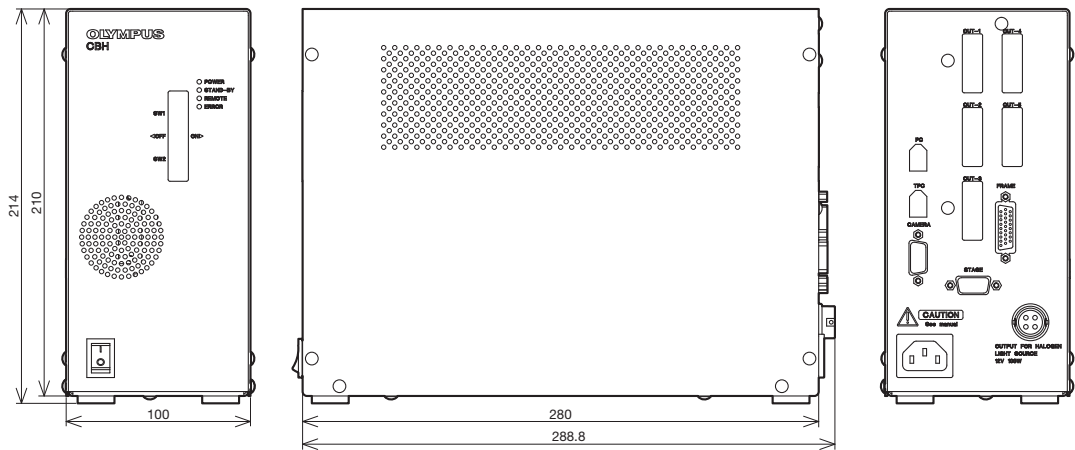
Motorized Units

Control Box for the BX3 Series

BX3-CBH

Control Box for Fully-Motorized Function

The control box can be connected to a PC via the IEEE1394 cable.



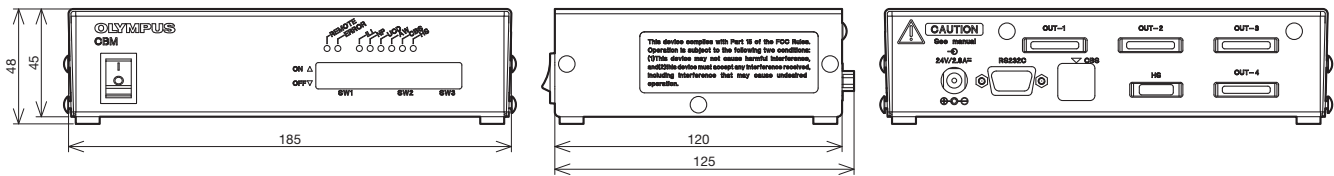
Weight: 4.2 kg

U-CBM

Control Box M for Motorized Function

The control box can be connected to a PC via a RS232 cable.

*Please consult your local Olympus representative for a detailed system chart.



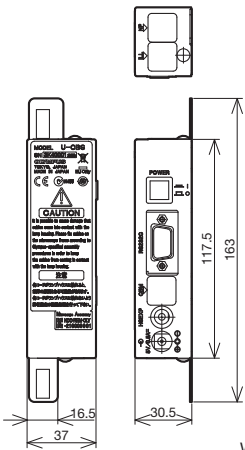
Weight: 0.82 kg

U-CBS

Control Box for Coded Function

The control box can be connected to a PC via a RS232 cable (attached onto the microscope frame).

*Please consult your local Olympus representative for a detailed system chart.



Weight: 0.5 kg

Unit: mm

Optical Terminology

1. FN and Practical Field of View

The field number (FN) is the size (in mm) of the eyepiece diaphragm, which defines the viewable area of a specimen. The diameter on the sample plane that can actually be viewed through the eyepiece is known as the practical field of view (FOV) and is determined by the following formula:

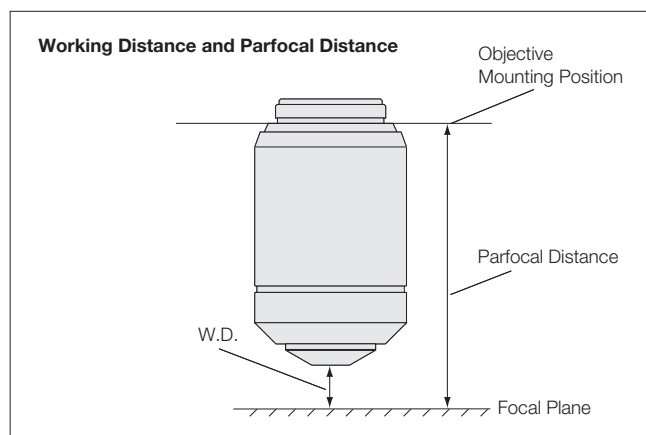
$$FOV = \frac{\text{Eyepiece FN}}{\text{Objective Magnification}} \text{ (mm)}$$

2. Working Distance

The working distance (W.D.) is the distance between the front edge of the objective and the specimen surface (or the surface of the cover glass when using a cover glass objective) when the specimen is in focus.

3. Parfocal Distance

The parfocal distance is the distance between the objective mounting plane and the specimen. In UIS2/UIS objectives, the parfocal distance is designed to be 45 mm.



For the parfocal distance of the LCPLFLN-LCD series objectives, refer to the appropriate objective page.

4. Relationship Between the Objective's Focal Length and Magnification

The magnification indicated for a UIS2/UIS objective is the value when the focal length of the tube lens is 180 mm.

$$M_{(ob)} = \frac{\text{Focal Length of Tube Lens}}{f}$$

$M_{(ob)}$: Objective magnification

f : Objective's focal length

5. Total Magnification

5.1 Observation Through Eyepiece (binocular observation)

$$M_{(bino)} = M_{(ob)} \times M_{(oc)}$$

$M_{(bino)}$: Total magnification for binocular observation

$M_{(ob)}$: Objective magnification

$M_{(oc)}$: Eyepiece magnification

5.2 Video Monitor Observation

● Total Magnification for Video Monitor

$$M_{(\text{video monitor})} = M_{(ob)} \times M_{(\text{video camera adaptor})} \times \text{Monitor Magnification}^*$$

$M_{(\text{video monitor})}$: Total Magnification on the Video Monitor

$M_{(ob)}$: Objective Magnification

$M_{(\text{video camera adaptor})}$: Projected magnification for video camera adaptor including photo eyepiece
(refer to Figure 1)

*Refer to Figure 3 for "monitor magnification"

● Practical Field of View for Video Monitor Observation

$$\text{Practical Field of View for Video Monitor Observation} = \frac{\text{Image Device Size}^*}{M_{(ob)} \times M_{(\text{video camera adaptor})}}$$

$M_{(ob)}$: Objective Magnification

$M_{(\text{video camera adaptor})}$: Projected magnification for video camera adaptor including photo eyepiece
(refer to Figure 1 for projected magnifications)

*Refer to Figure 2 for image device size

Figure 1 Video Camera Adaptor and Projection Magnifications

Video Camera Adaptor (projection lens)	Projection Magnification
U-TV1X-1 + Video Camera Mount Adaptors	1X
U-TV1XC	1X
U-TV0.63XC	0.63X
U-TV0.5XC-3	0.5X
U-TV0.35XC-2	0.35X
U-TV0.25XC	0.25X

Figure 2 Imaging Device Size

Camera Format	Diagonal	Horizontal	Vertical
1/3"	6.0 mm	4.8 mm	3.6 mm
1/2"	8.0 mm	6.4 mm	4.8 mm
2/3"	11.0 mm	8.8 mm	6.6 mm

The above table is for standard image device sizes.
Check your device size for precise calculation.

Figure 3 Imaging Device Size and Monitor Magnifications

Camera Format	Monitor Size (diagonal)				
	10"	15"	17"	19"	21"
1/3"	42.3X	63.5X	72.0X	80.4X	88.9X
1/2"	31.8X	47.6X	54.0X	60.3X	66.7X
2/3"	23.1X	34.6X	39.3X	43.9X	48.5X

Example

What is the total magnifications for a video monitor when a objective is 50X, a video camera adaptor U-TV0.5XC, a 2/3" video camera, and a 21" monitor are used ?

Optical Terminology

•Total magnification on the video monitor:

$M_{(ob)}=50X$, $M_{(video\ camera\ adaptor)}$ is 0.5X from Figure 1, and the monitor magnification is 48.5x from Figure 3.

$M_{(monitor\ observation)}=M_{(ob)} \times M_{(video\ camera\ adaptor)} \times \text{monitor magnification}$
 $=50 \times 0.5 \times 48.5=1213X$

•Practical field of view for video observation (horizontal side):

$M_{(ob)}=50X$, $M_{(video\ camera\ adaptor)}$ is 0.5X (from Figure 1), and the horizontal side of a 2/3" imaging device is 8.8 mm (from Figure 2)

$$\begin{aligned} \text{Practical Field of View for Video Observation} &= \frac{\text{Image Device Size}}{M_{(ob)} \times M_{(video\ camera\ adaptor)}} \\ &= \frac{8.8\text{ (mm)}}{50 \times 0.5} = 52\text{ }\mu\text{m} \end{aligned}$$

6. NA

The numerical aperture is a key factor to the performance of an objective (resolving power, focal depth, and brightness). The NA is determined by the following formula:

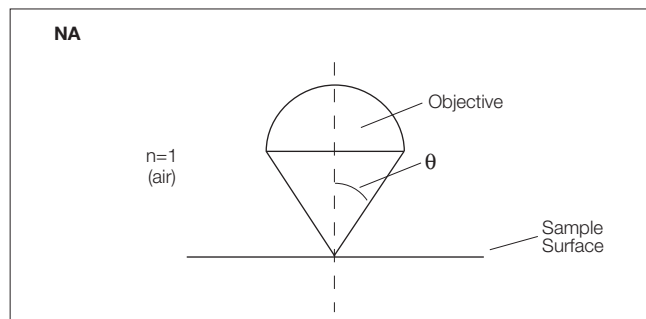
$$NA = n \times \sin\theta$$

n =The refraction rate of the medium between the specimen and objective. (Air: $n=1$, oil: $n=1.515$)

θ : The angle made by the optical axis and refraction of the light farthest from the center of the lens.

The visual field brightness (B) of the microscope is determined by the following formula in relation to the objective magnification (M). The larger the NA and the lower the objective magnification, the brightness will increase by a factor of the second power.

$$B \propto \frac{NA^2}{M^2}$$



7. Resolving Power

The resolving power of an objective is measured by its ability to differentiate two lines or points in an object. The greater the resolving power, the smaller the minimum distance between two lines or points that can still be distinguished. The larger the NA, the higher the resolving power.

●Resolving Power Formula

The following formula is generally used for determining resolution.

$$\epsilon = 0.61 \times \frac{\lambda}{NA} \quad (\text{Reyleigh formula})$$

λ : Wavelength or radiation in use

($\lambda=0.55\text{ }\mu\text{m}$ is used for visible light.)

NA: Objective NA

Example

MPLFLN100X (NA=0.90), $\lambda=0.55\text{ }\mu\text{m}$

$$\epsilon = 0.61 \times \frac{\lambda}{NA} = \frac{0.3355}{NA} = \frac{0.3355}{0.90} = 0.37\text{ }\mu\text{m}$$

8. Focal Depth of Microscope

The focal depth refers to the depth of the specimen layer that is in sharp focus at the same time, even if the distance between the objective and the specimen plane is changed when observing and imaging the specimen plane using the microscope. Because human eyes are individually different in the ability to adjust their focus, each person's perception of the focal depth varies.

At present, the Berek formula is generally used because it gives a focal depth value that often coincides with the focal depth obtained through experiments.

Focal Depth Formula

●Visual Observation (Berek formula)

$$\pm \text{DOF} = \frac{\omega \times 250,000}{NA \times M} + \frac{\lambda}{2(NA)^2} \quad (\mu\text{m})$$

DOF: Depth of Focus

ω : Resolving Power of Eyes 0.0014

(when the optical angle is 0.5 degrees)

M : Total Magnification

(objective magnification x eyepiece magnification)

$$\rightarrow \pm \text{DOF} = \frac{350}{NA \times M} + \frac{0.275}{NA^2} \quad (\lambda=0.55\text{ }\mu\text{m})$$

This indicates that the focal depth becomes smaller as the numerical aperture becomes larger.

Example

With MPLFLN100X (NA=0.90), WHN10X:

$$\pm \text{DOF} = \frac{350}{0.90 \times 1,000} + \frac{0.275}{0.81} = 0.39 + 0.34 = 0.73\text{ }\mu\text{m}$$

●Video Camera

In the case of a video camera, the focal depth will vary according to the number of pixels of the CCD, optical magnification, and numerical aperture. The above-mentioned formula is used as a rough guide only.

9. Aberrations

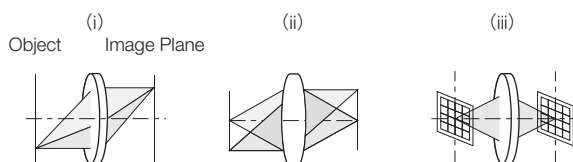
A difference between an ideal image and the actual image that passes through an optical system is called an “aberration.”

9.1 Requirements for Ideal Image Formation

The following three requirements must be satisfied to form an image with no aberrations, or an ideal image.

- (i) All the light rays coming from a single point and passing through an image formation optical system converge on a single point.
- (ii) Image points, which correspond to object points on the same plane perpendicular to the optical axis, are present on the same plane.
- (iii) The planar shape of an object and the planar shape of an image that are on the same plane perpendicular to the optical axis have a similar relation.

Figure 9-1 Requirements for Ideal Image Formation



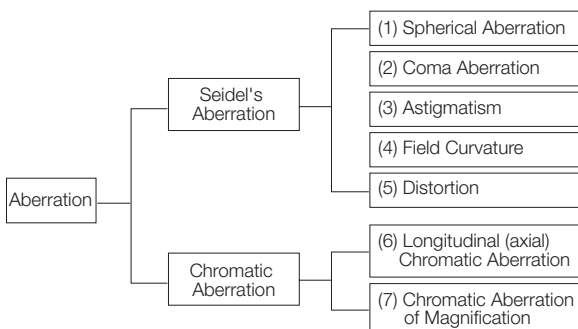
In an actual optical system, however, it is very difficult to strictly meet the requirements for ideal image formation, and this causes “aberrations” that interfere with image-forming performance.

9.2 Classification of Aberrations

Aberrations that interfere with image-forming performance are classified as shown below in Figure 9-2.

Seidel's Aberration = “Expansion of a Point Image” + “Curvature of the Image Plane” + “Deformation”

Figure 9-2 Classification of Aberrations



Types (1) to (3) correspond to “expansion of a point image” that goes against requirement (i) for ideal image formation in Figure 9-1. Type (4) corresponds to “curvature of image plane” that goes against requirement (ii) in Figure 9-1.

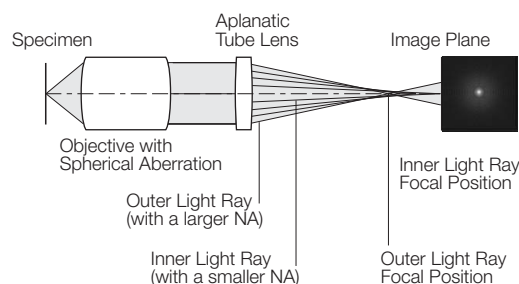
Type (5) corresponds to “deformation” that goes against requirement (iii) in Figure 9-1.

Types (6) and (7) correspond to the “color blur” of images caused by characteristics of glass materials used for the optical system. “Expansion of a point image” can also be expressed by “wavefront aberration” that regards the light as “waves” and takes into account the phase to include the influence of diffraction.

(1) Spherical Aberration

When light rays coming out of an axial object point enter a lens, the light rays with a larger numerical aperture (NA) are subjected to stronger refraction power and cross the optical axis in positions further away from the ideal image formation position. The aberration caused by different image forming positions due to the differences in NA of axial light rays is called “spherical aberration.” (“Spherical aberration” is proportional to NA to the third power.)

Figure 9-3 Spherical Aberration

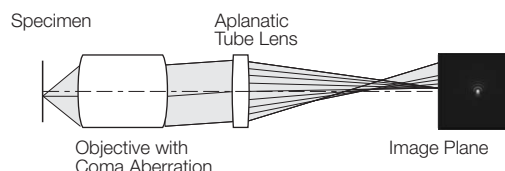


Typically, objectives with a larger NA have better resolution but worse spherical aberration. Our advanced design and manufacturing techniques have realized good optical performance even with a large numerical aperture.

(2) Coma Aberration

Even though spherical aberration is compensated to be very small, there are cases where light rays coming out of an off-axis object point are not condensed to a single point on the image plane but, instead, generate asymmetric blur that looks like a comet leaving traces. This is called coma aberration.

Figure 9-4 Coma Aberration and Spot Shape on the Image Plane

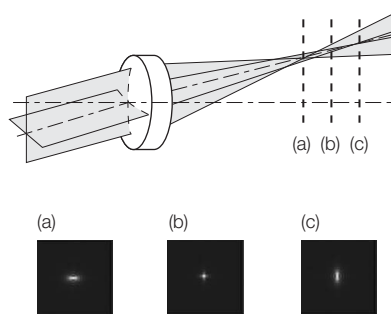


Optical Terminology

(3) Astigmatism

Even though a lens is compensated for spherical aberration and coma aberration, there are cases where an image of an off-axis object point is not focused to a single point but separated to a concentric line image and a radial line image. This is called “astigmatism.” When astigmatism is present, a point image blurs vertically and horizontally, before and after the focus position.

Figure 9-5 Astigmatism and Change in Spot Shape in Different Focus Positions



(4) Field Curvature

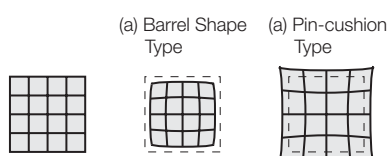
An image plane of an object on a plane perpendicular to an optical axis does not always become a plane perpendicular to the optical axis, but it generally becomes a curved plane. This symptom is called “field curvature.”

When field curvature is present, the image is more displaced as it becomes closer to the periphery of the visual field. Therefore, when the center of an image is brought into focus, blur occurs in the peripheral areas of the image. To bring the entire image, including the periphery, into clear focus, it is necessary to adequately compensate for this type of aberration.

(5) Distortion

When there is no similar relation between a planar shape on an object and a shape on the image plane, this is called “distortion.” When distortion is present, a square image appears in a shape of a barrel or pin-cushion as shown in Figure 9-6.

Figure 9-6 Distortion



The microscope optical system contains some distortion. When distortion is present, it can bring erroneous results of shape measurements. When a microscope is used for precision measurements, pay close attention to this aberration, for example, by providing it with an aberration compensation function.

(6) Chromatic Aberration

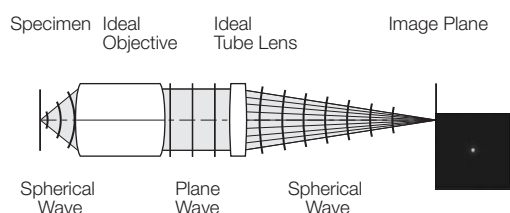
Glasses used for optical systems have different refractive indexes depending on the wavelength. This causes differences in focal length between wavelengths and generates displacement of image forming position. This phenomenon is called “chromatic aberration,” which is sometimes subdivided into axial displacement on the optical axis, called “axial chromatic aberration” (or lateral chromatic aberration) and displacement on the image plane, called “chromatic aberration of magnitude.”

Many special glass materials are used, e.g., for apochromats, to eliminate chromatic aberration in a wide range from violet light (g-rays with wavelength of 435 nm) to red light (c-rays with wavelength of 656 nm).

9.3 Wavefront Aberration

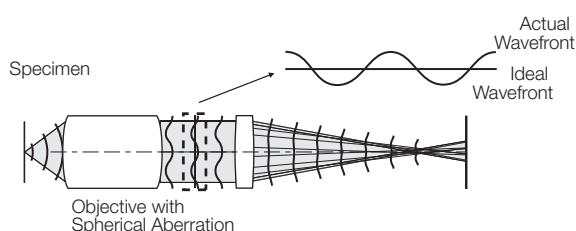
For a long time, aberrations have been used in “geometric optics,” which considers light as “light rays.” Microscope optical systems are often used to observe very small specimens at the wavelength level and sometimes adopt “wave optics,” which regards light as “waves” and handles the phase information, accounting for the influence of diffraction. In such a case, “wavefront aberration” is used for evaluation. As shown below, when requirements for ideal imaging are satisfied in a microscope optical system, the spherical wavefront (spherical waves) coming from a single point on an object (specimen) is converted to plane waves through an ideal objective. The plane waves are converted to spherical waves through an ideal tube lens and condensed to a single point. The wavefront of these waves is called the “ideal wavefront.”

Figure 9-7 Ideal Microscope Optical System



Based on the figure indicated for (1) spherical aberration, the behavior of the wavefront in an optical system that has an aberration is described below.

Figure 9-8 Illustration of Wavefront Aberration

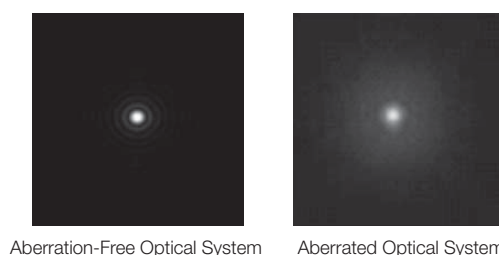


A difference (a degree of disagreement) between the ideal wavefront and the actual wavefront shown above is called “wavefront aberration.”

9.4 Strehl Ratio

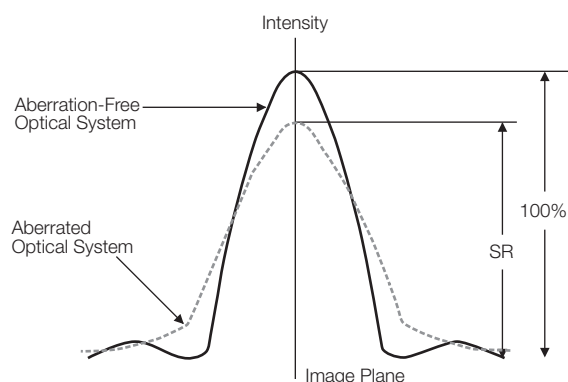
When a point light source is observed with an aberration-free optical system and an aberrated optical system, the former concentrates the focal point to a point at the image formation position. In contrast, the latter fails to produce a focal point, instead causing a spread in the intensity distribution of the point image (this is known as “point spread”). The specific appearance of such a point image (i.e. point spread) is shown in Figure 9-9.

Figure 9-9 Appearance of Condensed Light in the Image Plane (point spread)



With the proportion of light concentrated in the image plane (intensity of light concentrated in the Airy disk) by an aberration-free optical system serving as 100%, the proportion of light concentrated by an aberrated optical system is known as the Strehl ratio (SR). When graphed, the Strehl ratio reveals peaks in intensity as shown in Figure 9-10. The higher the SR, the closer an optical system is to being aberration-free.

Figure 9-10 Strehl Ratio (SR)



A Strehl ratio of 80% is typically called the diffraction limit, and lenses with a lower ratio lack the performance required to serve as an objective. A ratio of over 95% means that the lens' performance in general observations is comparable to that of an aplanatic lens (which is corrected for spherical aberrations and coma).

Note: A laser interferometer is used to assess optical performance, so assessment is done at a single wavelength. Unless otherwise noted, Strehl ratio measurements are at the e-line (544 nm).

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OLYMPUS CORPORATION
Shinjuku Monolith, 2-3-1 Nishi-Shinjuku, Shinjuku-ku, Tokyo 163-0914, Japan

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