EVIDENT

Microscope Components Guide

Microscope Components for OEM Integration









Contents

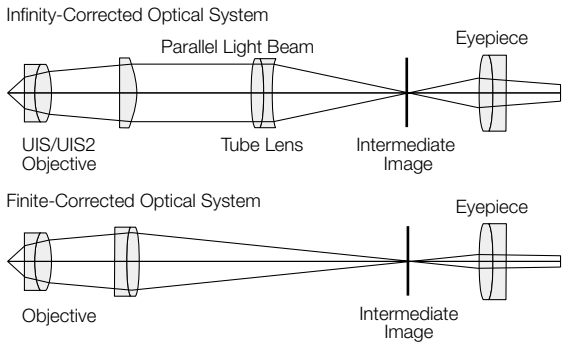
Introduction to UIS2 Optics

Take 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. Using infinity-corrected optics, the intermediate image is formed by the objective without a tube lens.

Figure 1. Infinity-Corrected and Finite-Corrected Optical System Principles



Advantages of Infinity-Corrected Optics

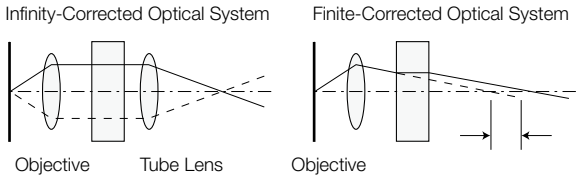
Infinity-corrected optics offer a number of advantages:

- 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 45 mm and the focal length of the tube lens is 180 mm.*

Figure 2. Advantages of an Infinity-Corrected Optical System

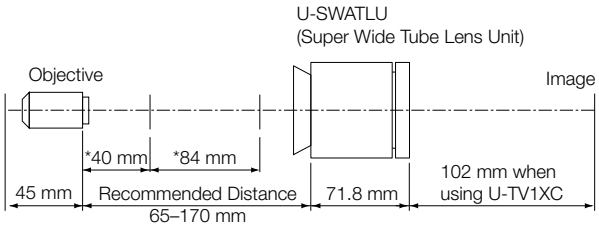


Basic Dimensions in the UIS2 Optical System

The UIS2 optical system corrects aberration with a dedicated tube lens and eyepiece; coma aberration and flatness are not degraded even when the tube lens' exit pupil position is modified by changing the objective and tube lens distance. This makes it possible to use a distance of 65 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

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 excellent performance by minimizing the aberrations that reduce resolution.

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

2. Objective Lenses with Image Parcentricity

Semi-apochromatic UIS2 objectives are designed to be parcentric. 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 provide natural 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. The entire optical system, including the tube lens, is designed to reproduce the actual colors of specimens, so users know that they can obtain realistic images of specimens even without using a digital microscope camera.

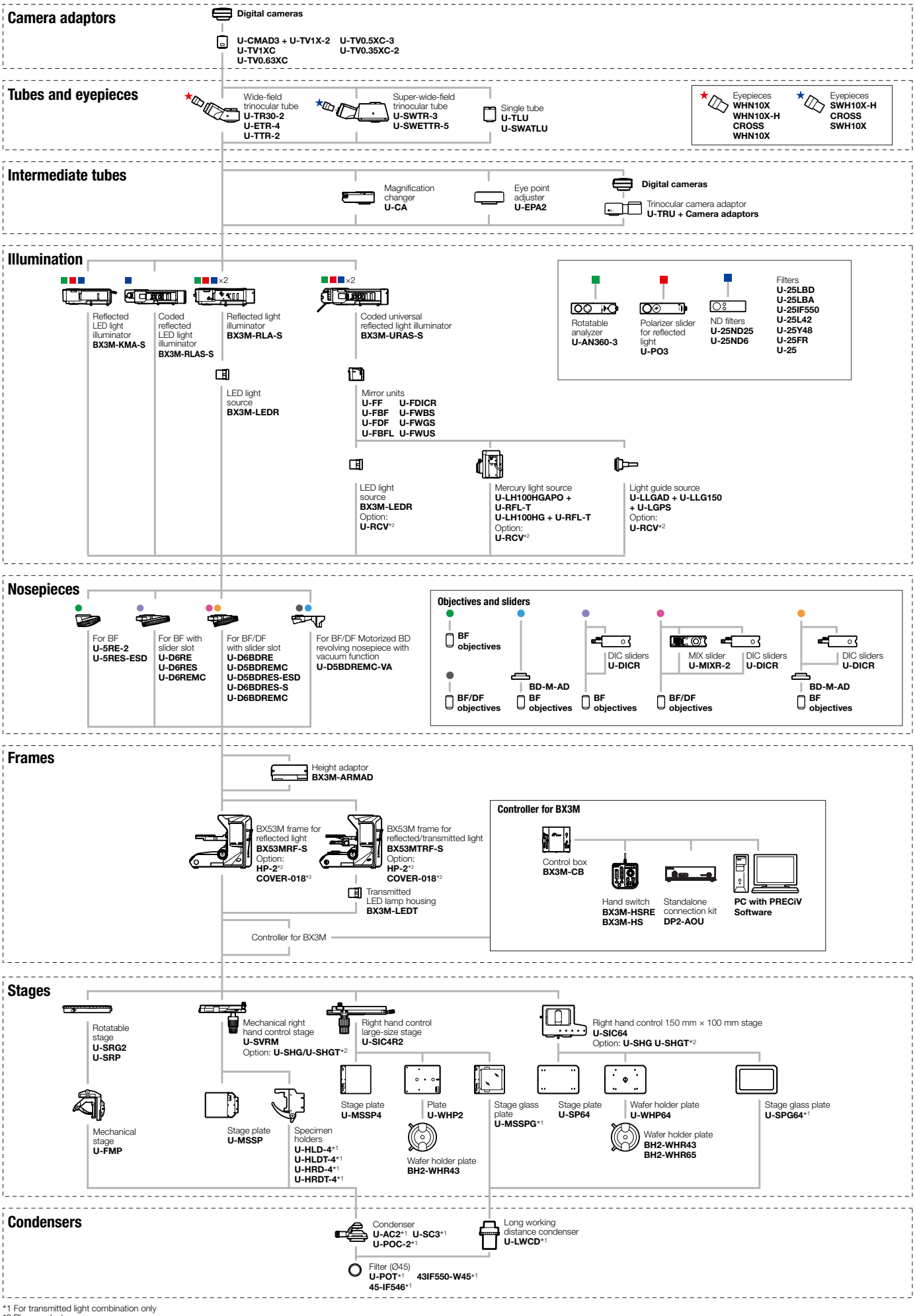
4. Reduced Weight

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

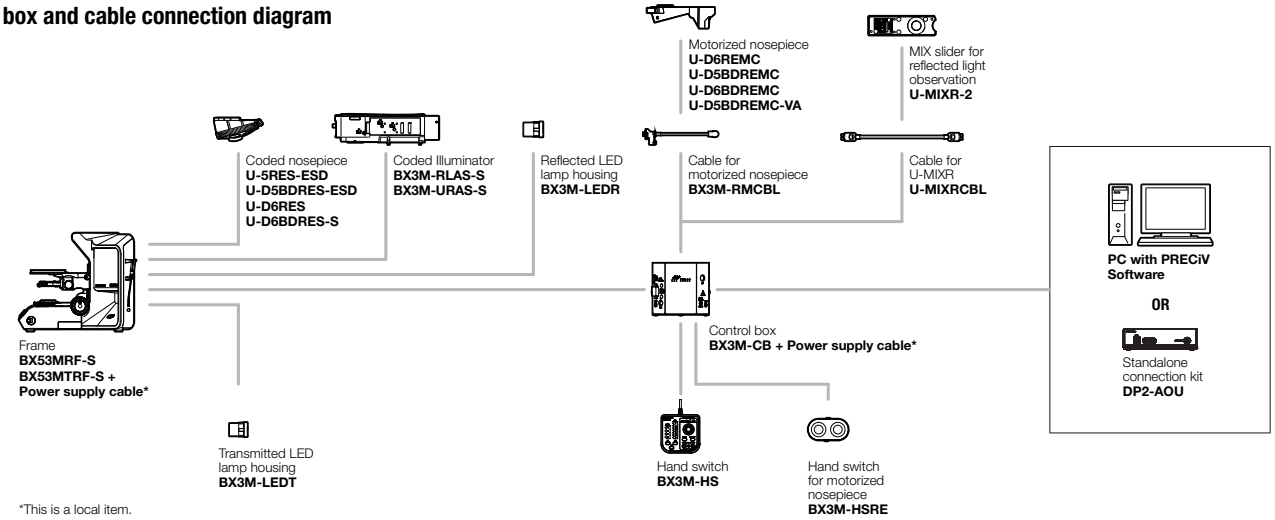
UIS2 objectives are made from lead- and cadmium-free eco-glass.

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



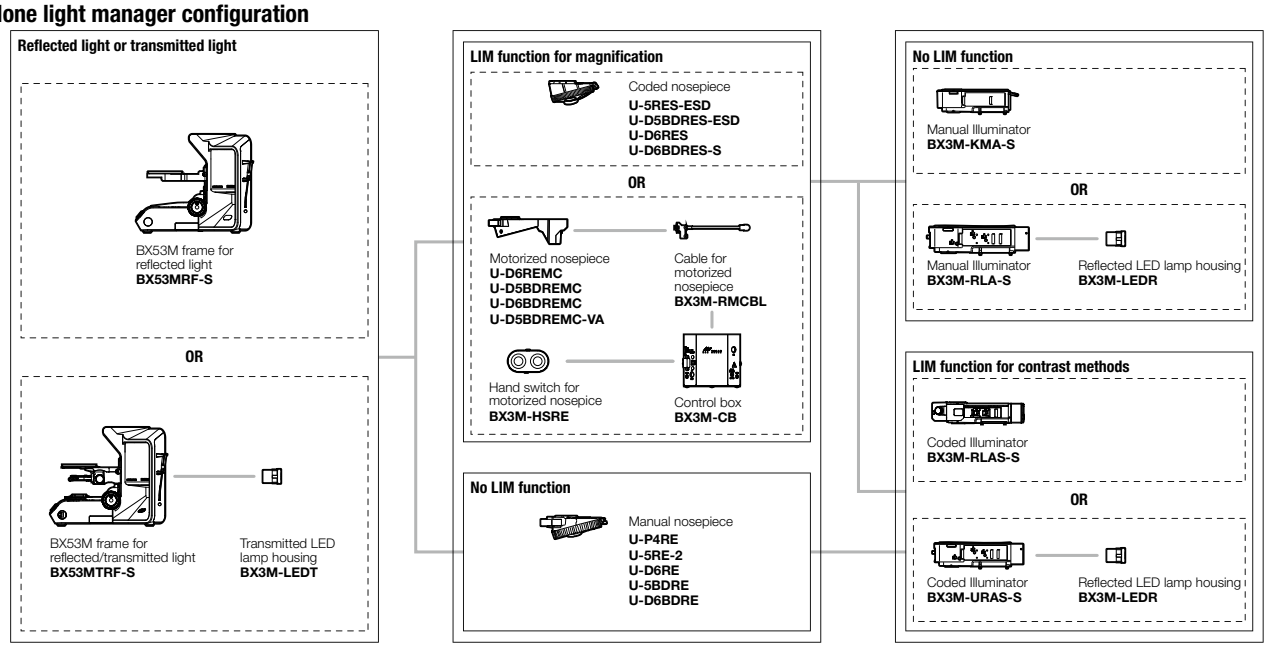
*1 For transmitted light combination only
*2 Please select as necessary

Control box and cable connection diagram

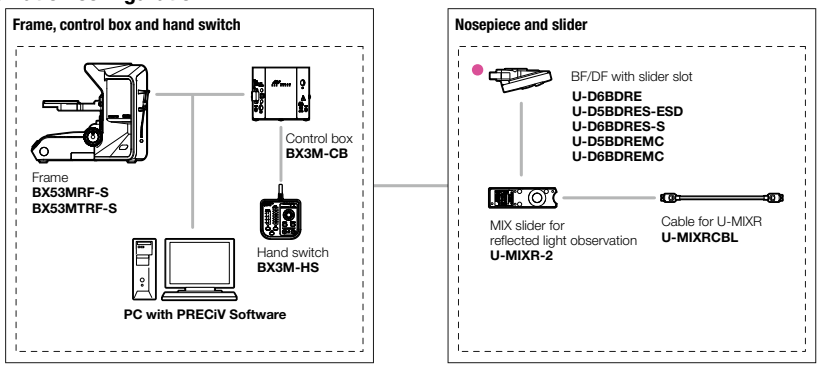


*This is a local item.

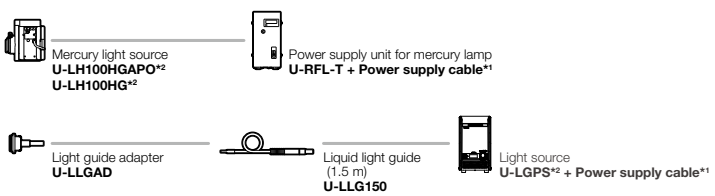
Stand-alone light manager configuration



MIX observation configuration



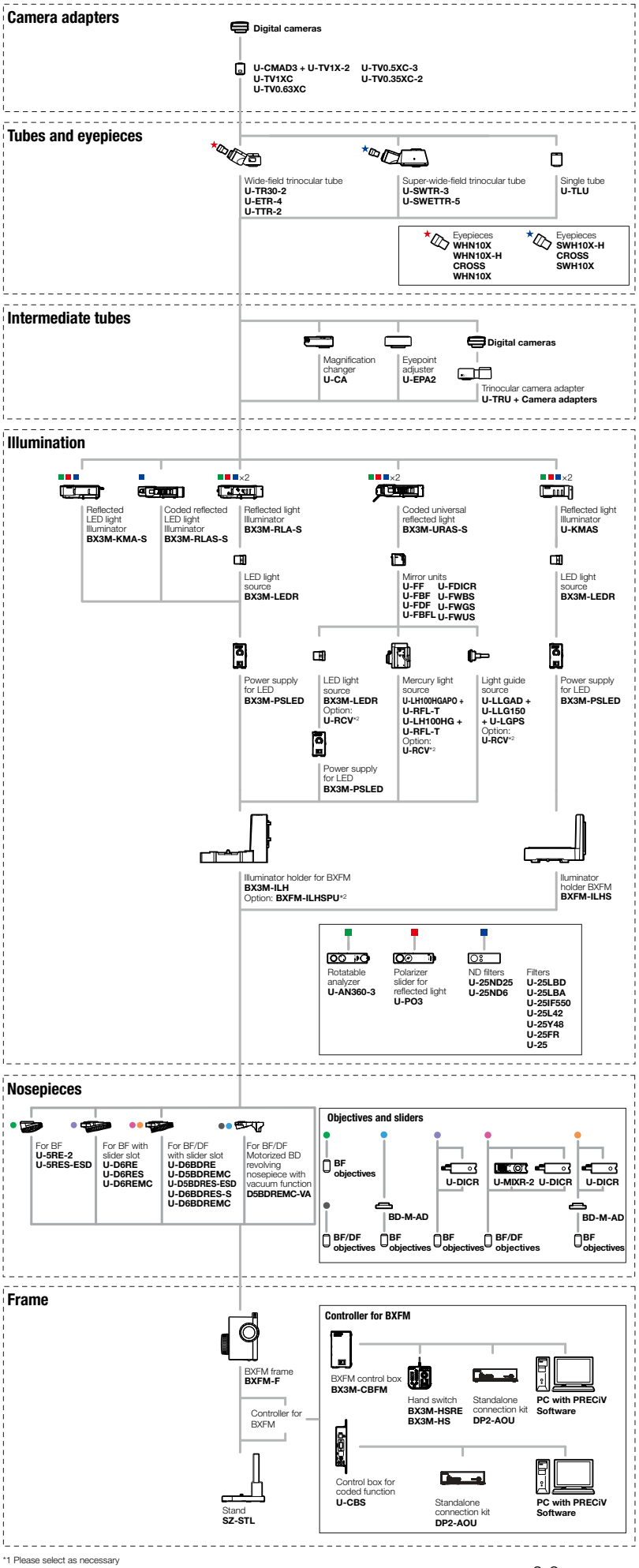
Illumination and cable connection diagram



*1 This is a local item.
*2 Bulbs are required for these light sources.

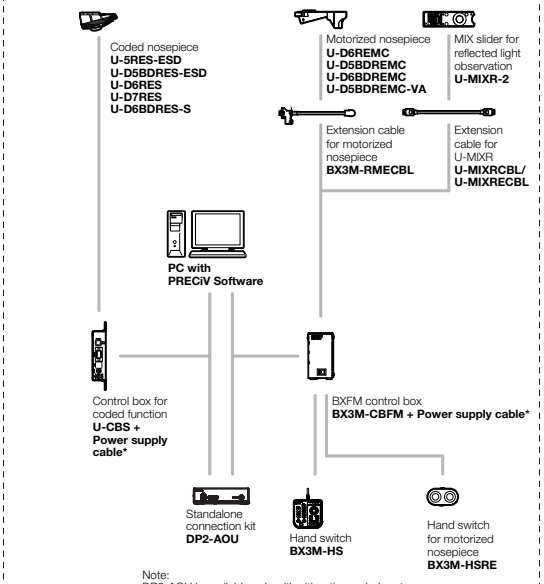
System Diagram

BXFM System Diagram



*1 Please select as necessary

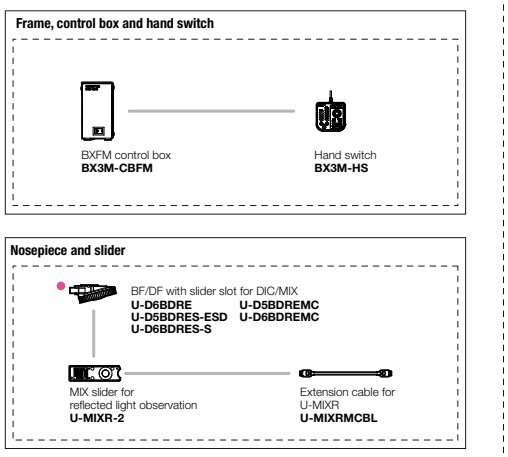
Control box and cable connection diagram



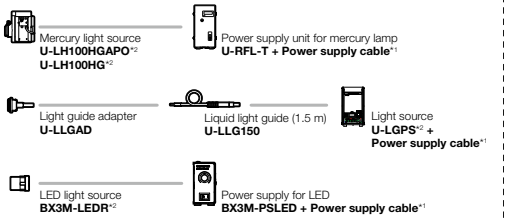
Note:
DP2-AOU is available only with either the coded system or the motorized system, but not with both.

*This is a local item.

MIX observation configuration



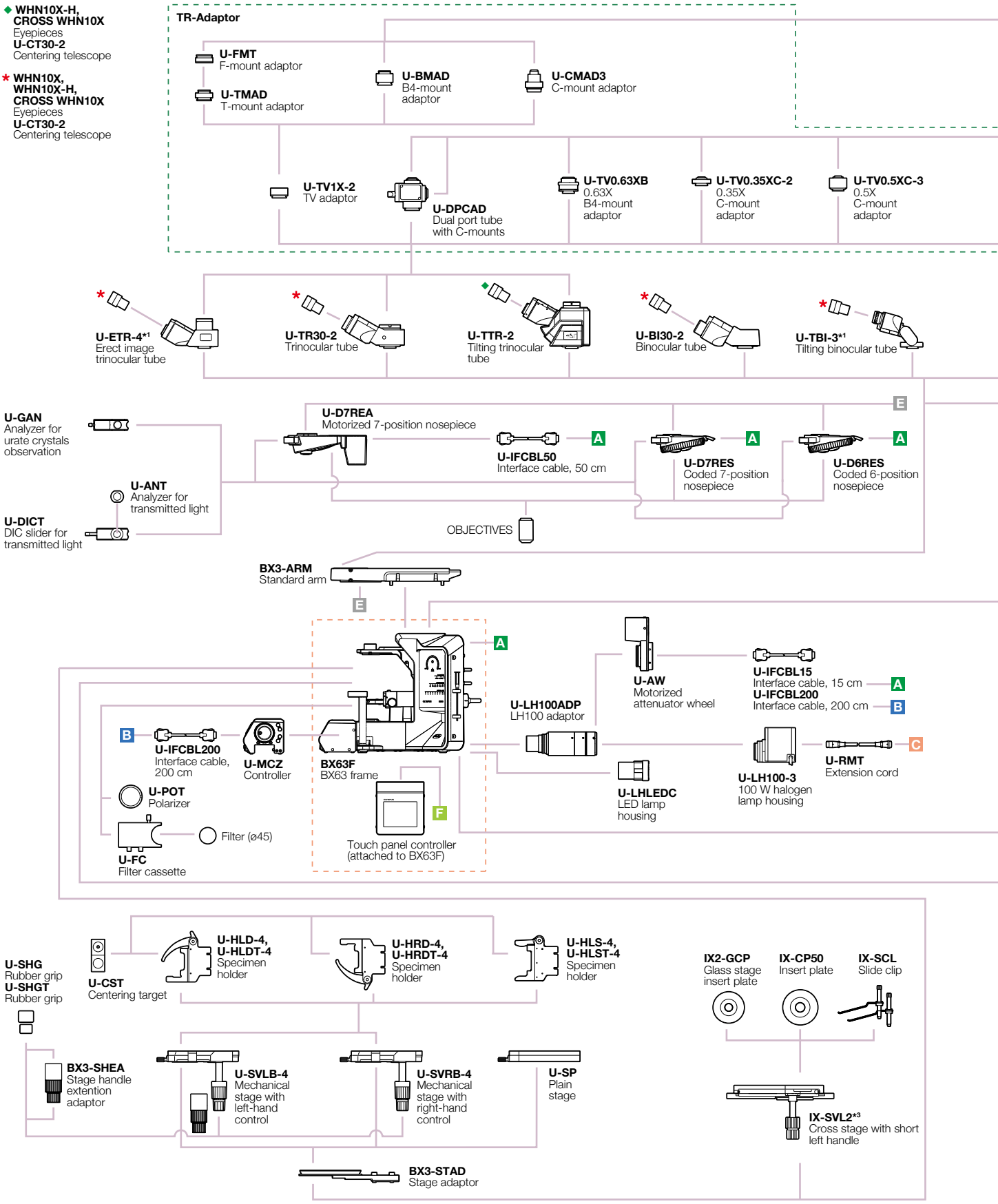
Illumination and cable connection diagram



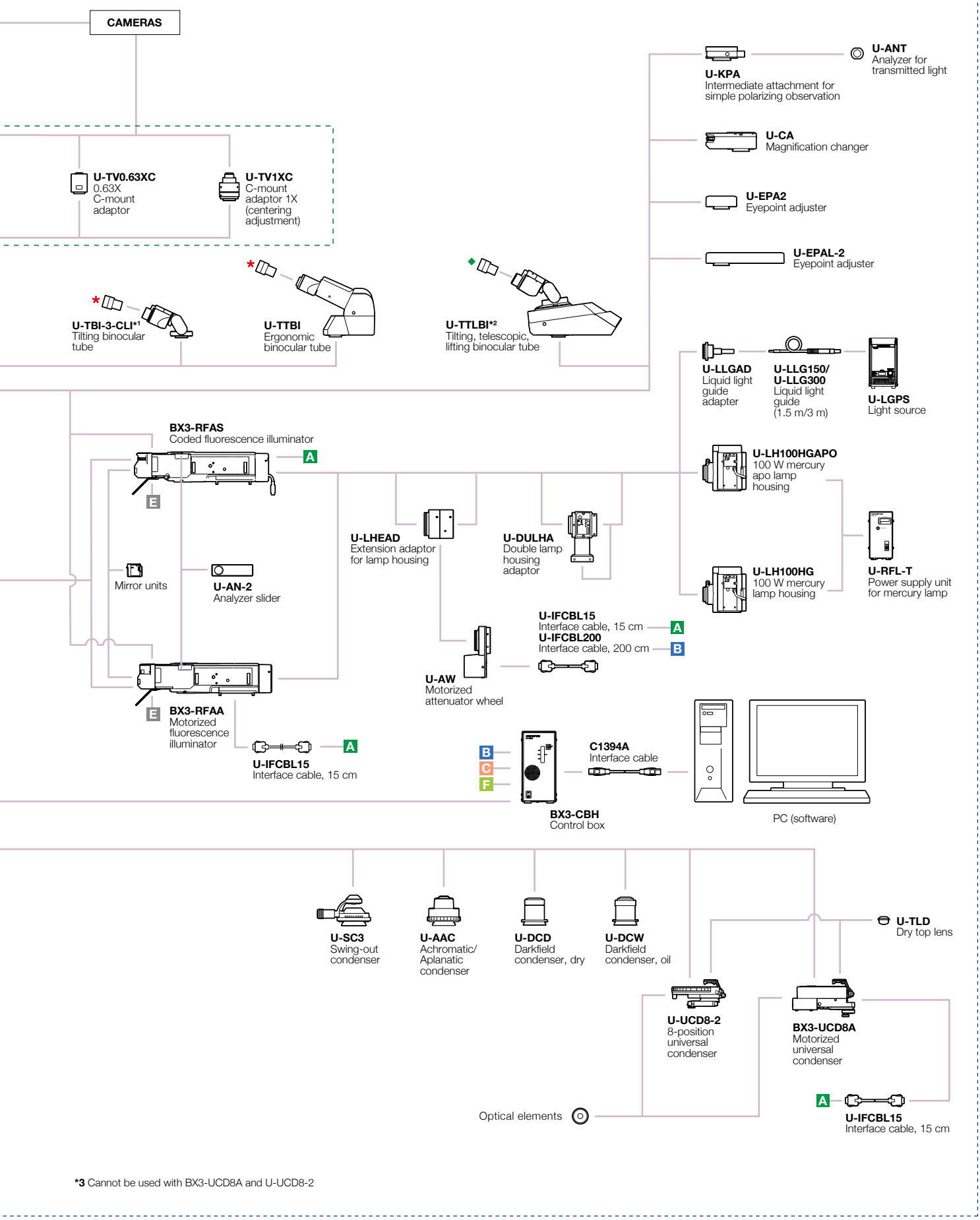
*1 This is a local item.
*2 Bulbs are required for these light sources.

System Diagram

BX63 System Diagram



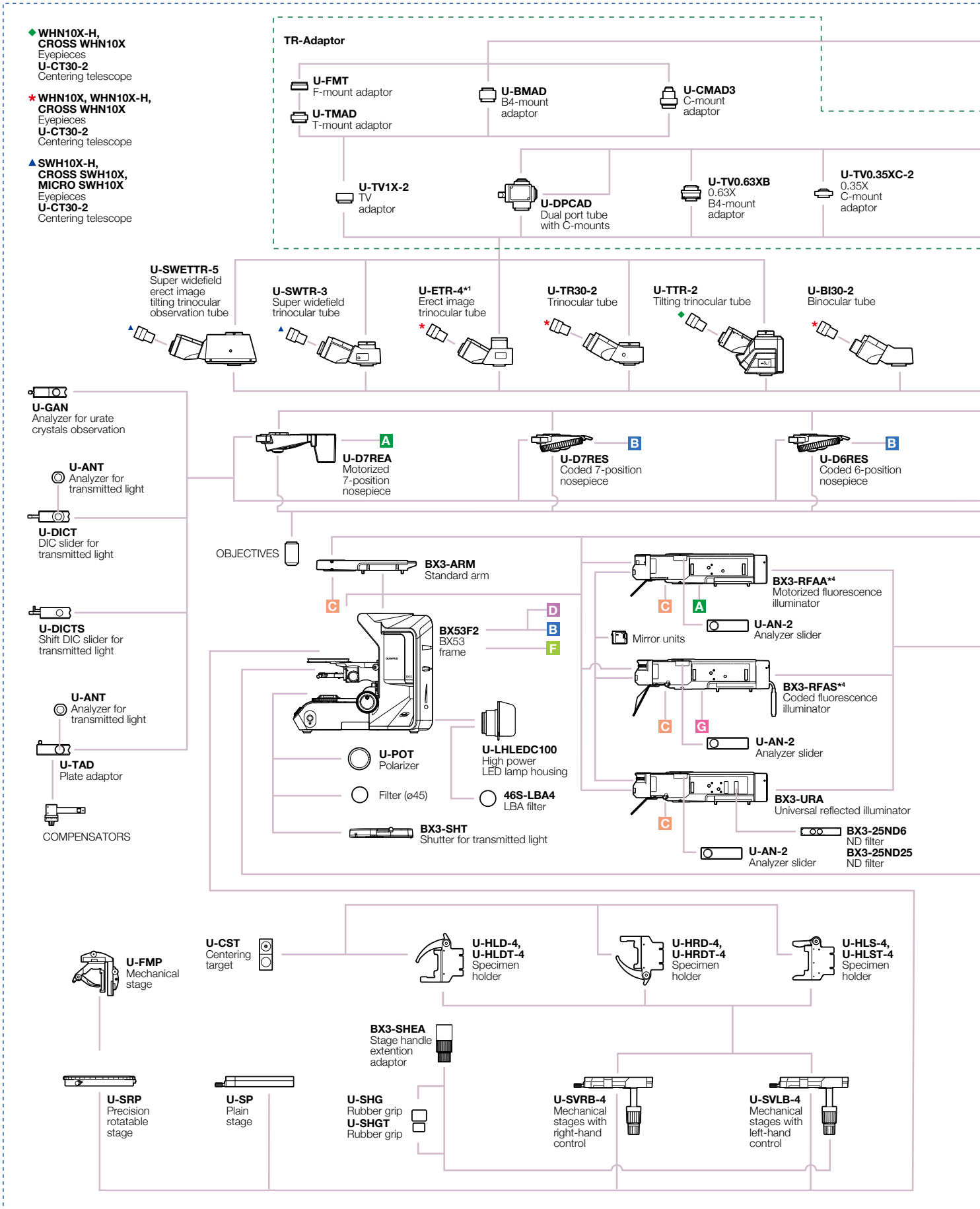
***1** Slight vignetting may occur in combination with an additional intermediate attachment or fluorescence illuminator. ***2** Require an additional intermediate attachment or fluorescence illuminator.



***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 Require 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 a standard equipment of the U-MDOSV, BX3-MDO18R, and U-MDO10R3.

CAMERAS

U-TV0.5XC-3
0.5X C-mount adaptor

U-TV0.63XC
0.63X C-mount adaptor

U-TV1XC
C-mount adaptor 1X (centering adjustment)

U-TBI-3[*1]
Tilting binocular tube

U-TBI-CLI[*1]
Tilting binocular tube

U-TTBI
Ergonomic binocular tube

U-TTLBI[*2]
Tilting, telescopic, lifting binocular tube

U-D6RE
Sextuple revolving nosepiece for DIC/simple POL

U-5RE-2
Quintuple revolving nosepiece

U-ANT
Analyzer for transmitted light

U-KPA
Intermediate attachment for simple polarizing observation

U-CA
Magnification changer

U-DP[*1*3]
Dual port

U-DP1XC
Dual port 1X

U-EPA2
Eyepoint adjuster

U-EPAL-2
Eyepoint adjuster

U-TRU[*1*3]
Trinocular intermediate unit

U-TRUS[*1]
Trinocular intermediate unit

U-CPA
Intermediate attachment for conoscopic andorthoscopic observation

U-AN360P
Rotatable analyzer

U-OPA
Intermediate attachment for orthoscopic observation

U-DO3
Dual observation attachment

U-SDO3
Side by side observation attachment

BX3-MDOE
Multi-observation extension

U-MDOSV[*6]
Multi-observation side viewer

U-MDOB3
Multi-observation body

U-MDO10B3
Multi-observation body for 10 persons

U-MDO10R3[*6]
Multi-observation body for 10 persons

BX3-MDO18R
Multi-observation body for 18 persons

U-LLGAD
Liquid light guide adaptor

U-LLG150/ U-LLG300
Liquid light guide (1.5 m/3 m)

U-LGPS
Light source

U-LH100HGAPO
100 W mercury apo lamp housing

U-LH100HG
100 W mercury lamp housing

U-RFL-T
Power supply unit for mercury lamp

U-LHEAD[*5]
Extension adaptor for lamp housing

U-DULHA
Double lamp house adaptor

U-AW
Motorized attenuator wheel

U-LC[*7]
Low magnification condenser

U-AC2
Abbe condenser

U-SC3
Swing-out condenser

U-AAC
Achromatic/ Aplanatic condenser

U-PCD2
Phase/darkfield condenser

Stand[*6]

U-HSEXP
Hand switch forexposure

Optical devices

BX3-UCD8A
Motorized universal condenser

U-UCD8-2
8-position universal condenser

U-TLD
Dry top lens

U-DCD
Darkfield condenser, dry

U-DCW
Darkfield condenser, oil

U-CBS
Control box for coded function

CBSIFCBL200
Interface cab le, 200cm

U-IFRES
Interface for coded nosepiece

U-IFCBL200
Interface cable, 200 cm

U-HSCBM
Hand switch for CBM

BX3-CBM
Control box

DP2-AOU
Standalone Connection Kit

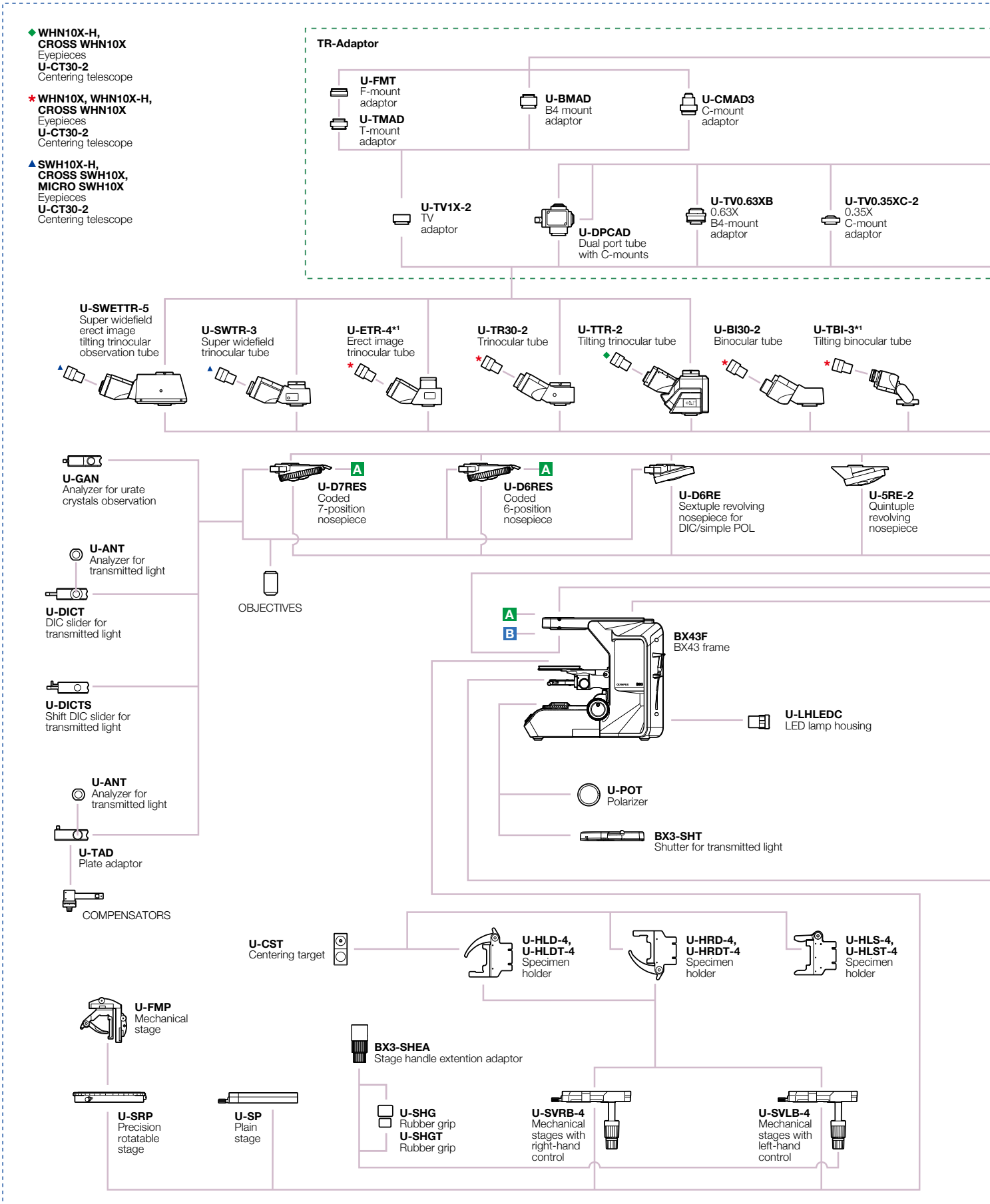
BX3M-HSRE
Hand switch

PC (Software)

*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 Require 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.

CAMERAS

U-TV0.5XC-3
0.5X
C-mount
adaptor

U-TV0.63XC
0.63X
C-mount
adaptor

U-TV1XC
C-mount
adaptor 1X
(centering adjustment)

U-CA
Magnification changer

U-DP*1*3
Dual port

U-DP1XC
Dual port 1X

U-TBI-CLI*1
Tilting binocular tube

U-TTBI
Ergonomic
binocular tube

U-TTLBI*2
Tilting,
telescopic,
lifting binocular tube

U-TRU*1*3
Trinocular intermediate unit

U-TRUS*3
Trinocular intermediate unit

U-ANT
Analyzer for
transmitted light

U-KPA
Intermediate attachment for
simple polarizing observation

BX43-5RES
Coded
5-position
nosepiece
for BX43

U-LLGAD
Liquid light
guide
adaptor

U-LLG150/
U-LLG300
Liquid light
guide
(1.5 m/3 m)

U-LGPS
Light source

U-EPA2
Eyepoint adjuster

U-EPAL-2
Eyepoint adjuster

U-LH100HGAPO
100 W mercury
apo lamp
housing

U-LH100HG
100 W mercury
lamp housing

U-RFL-T
Power supply unit
for mercury lamp

U-CPA
Intermediate
attachment for
conoscopic and
orthoscopic
observation

U-AN360P
Rotatable
analyzer

U-OPA
Intermediate attachment for
orthoscopic observation

BX3-URA
Universal reflected illuminator

U-PO
Polarizer

BX3-6ND6
ND filter
BX3-25ND25
ND filter

Mirror units

U-AN-2
Analyzer slider

BX3-RFAS*4
Coded
fluorescence
illuminator

U-DULHA
Double
lamp house
adaptor

U-DO3
Dual observation attachment

U-SDO3
Side by side observation
attachment

U-LC*5
Low
magnification
condenser

U-AC2
Abbe
condenser

U-SC3
Swing-out
condenser

U-AAC
Achromatic/
Aplanatic
condenser

U-PCD2
Phase/darkfield
condenser

U-DCD
Darkfield
condenser,
dry

U-DCW
Darkfield
condenser,
oil

U-TLD
Dry top lens

Optical devices

U-UCD8-2
8-position
universal
condenser

U-IFRES
Interface for
coded
nosepiece

U-CBS
Control box for
coded function

U-HSEXP
Hand switch for
exposure

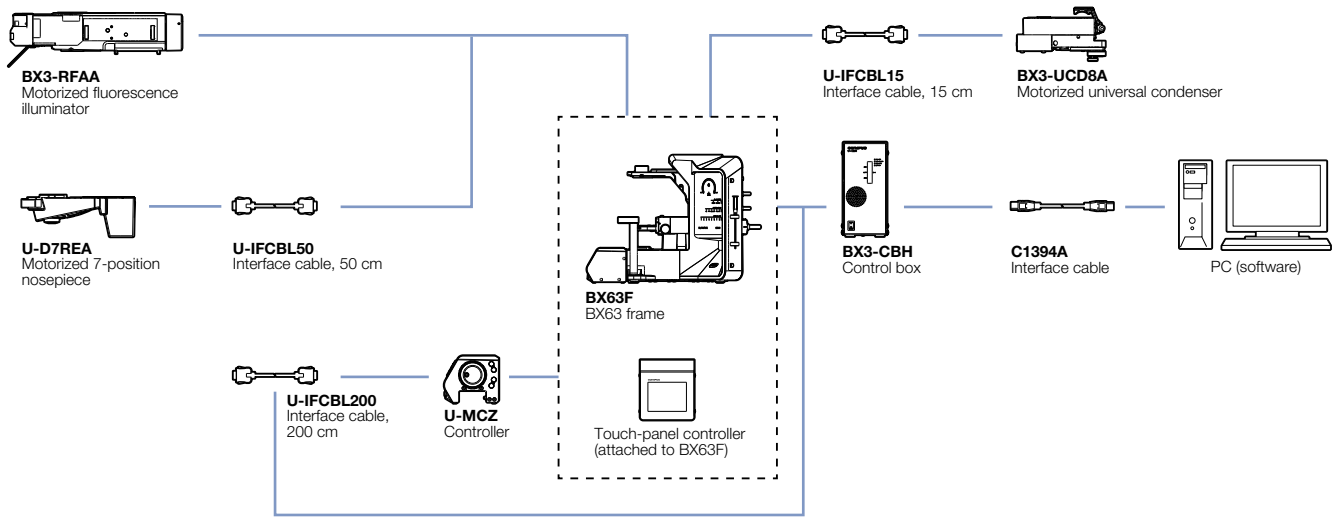
DP2-AOU
Standalone Connection Kit

PC (Software)

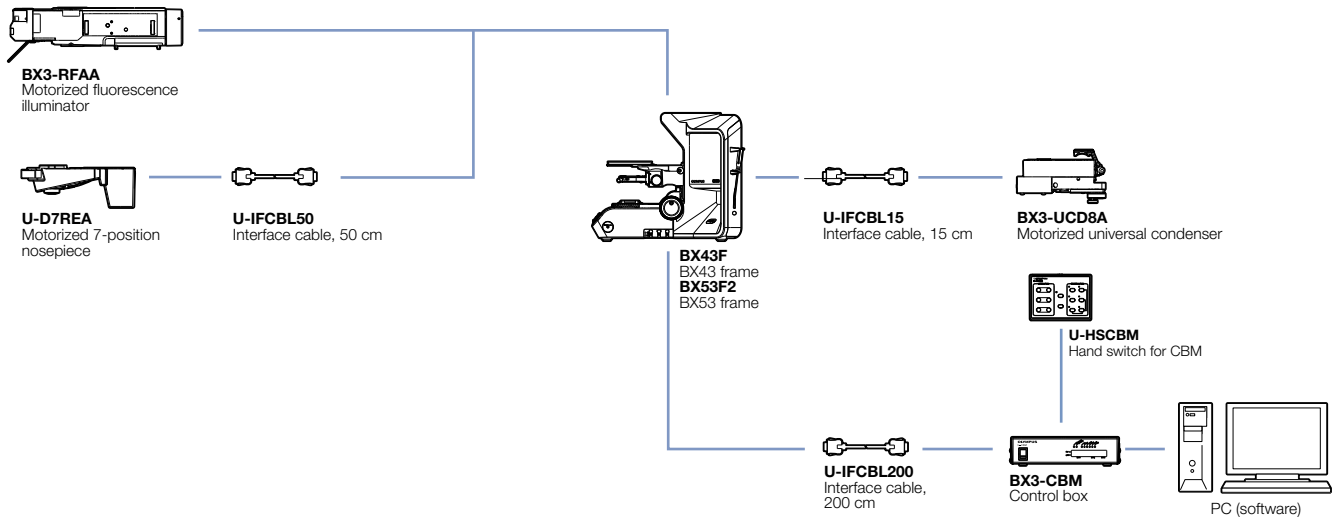
System Diagram

BX3 Series Basic Motorized System Diagram

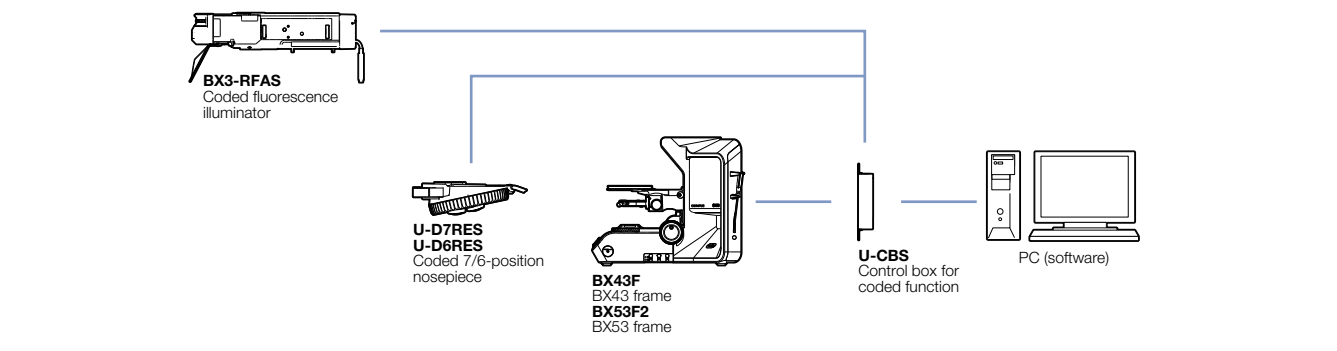
Full Motorized System Basic Configuration for BX3 Series



Semi-Motorized System Basic Configuration for BX3 Series



Coded System Basic Congratulation for BX3 Series

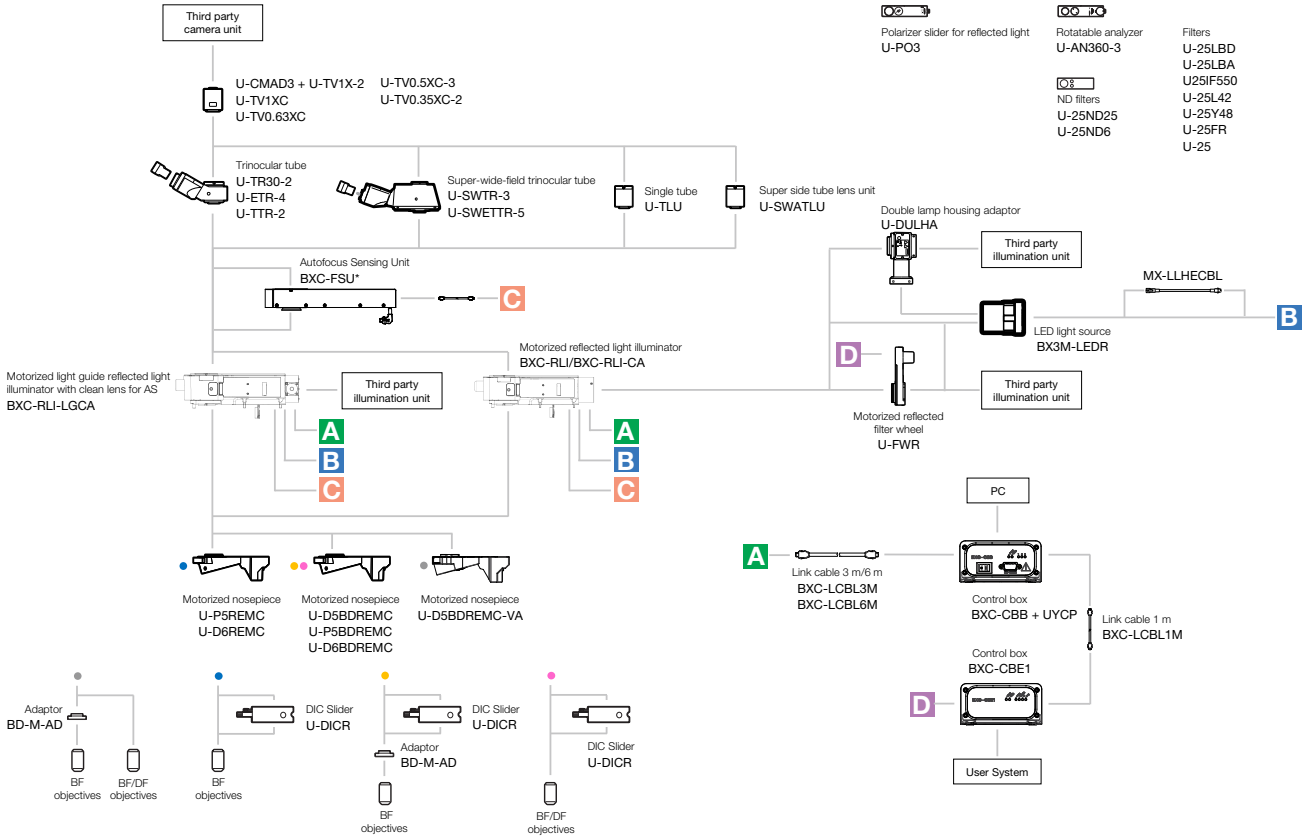


*Please refer to "Section 13 Motorized Unit" for each motorized unit in the detail.

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

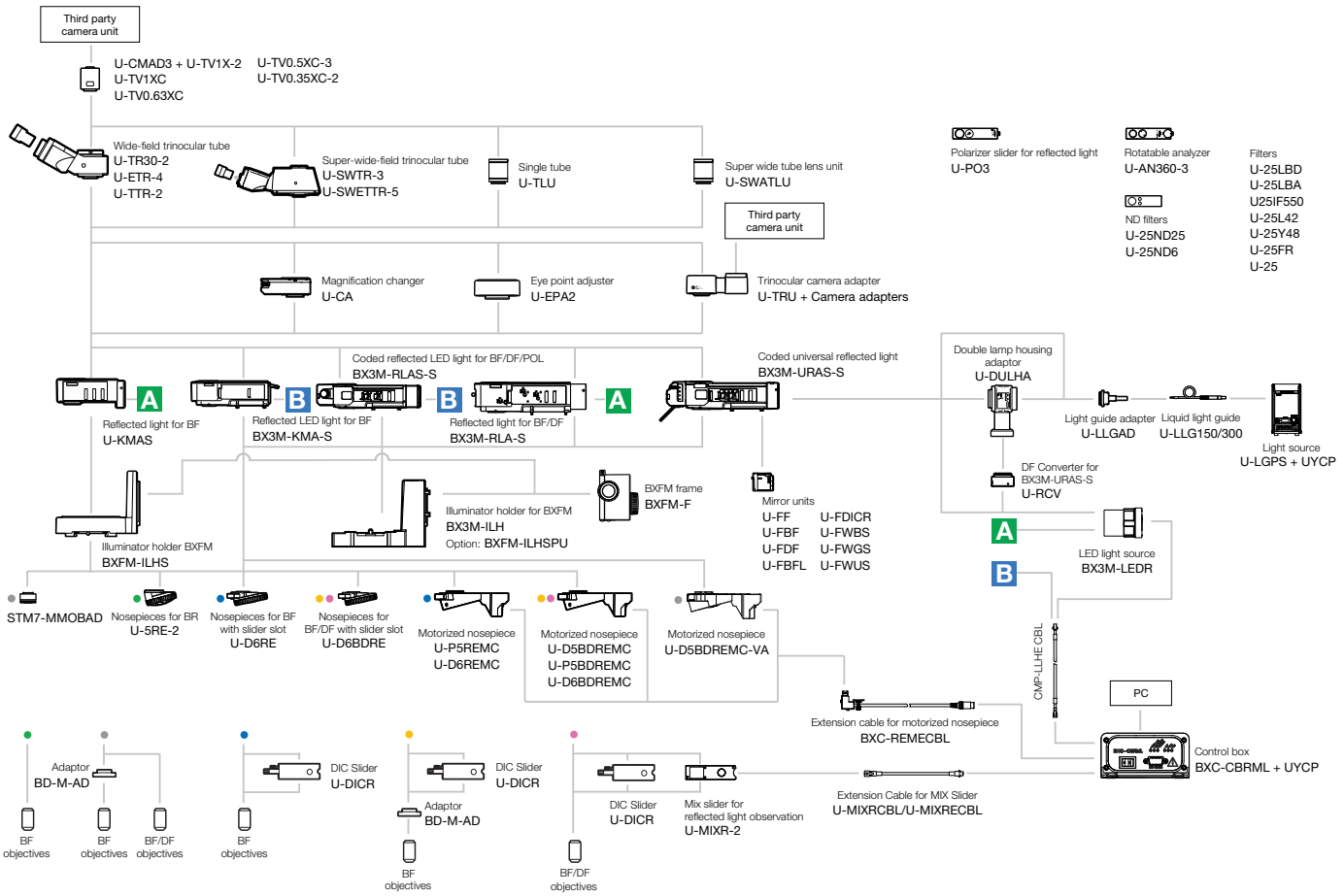
System Diagram

BXC-CBB System Diagram



*The BXC-FSU can be connected directly to the BXC-CBB to use auto focus with a manual illuminator. In this case, please note that the BXC-CBB cannot control the BX3M-LEDR without the BXC-RLI. If you want to use the BX3M-LEDR with a manual illuminator, please also use the BXC-CBRLM or use the BX3M-PSLED, which is a local control.
*When using the BXC-FSU, DIC observation and simple polarization observation are not possible even if it is manually operated.

BXC-CBRML System Diagram



UIS2 Objectives for Industrial Applications

Objective Abbreviation Guide

M PL(Plan) F L N - 1 0 0 B D

- **M:** Metallurgical (no cover)
- **MX:** High numerical aperture and long working distance for metallurgical use
- **LM:** Long working distance for metallurgical use
- **SLM:** Super long working distance for metallurgical use
- **LC:** Observation through substrate

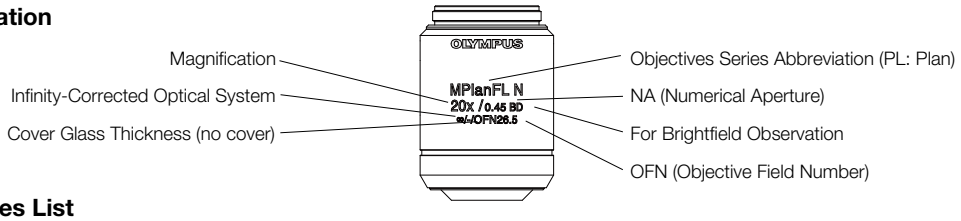
- **PL:** Plan: Corrects field curvature on the periphery of the image plane

- **None:** Achromat/ Effectively corrects chromatic aberration at 486 nm and 656 nm wavelengths
- **FL:** Semi-apochromat/ Corrects chromatic aberration that is in the middle of apochromat and achromat
- **APO:** Apochromat/ Effectively corrects chromatic aberration in the entire visible range (435-656 nm)

- **Number:** Objective magnification

- **None:** Brightfield
- **BD:** Brightfield/darkfield
- **IR:** Infrared
- **LCD:** Observation through LCD panels

Objective Notation



Objective Series List

Series	Magnification	BF	DF	DIC*1	POL	FL	OFN (Objective Field Number)	Remarks
MPLAPON	50/100	○		○U	○		26.5	
MPLAPON O	100	○			○	○	26.5	
MXPLFLN	20/50	○		○U	○	○*4	26.5	
MXPLFLN-BD	20/50	○	○	○U	○	○*4	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*2/50/100	○		○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	2.5/5/10/20/50/100/150	○	○	○U	○	○*3	26.5	
LMPLFLN-BD	5/10/20/50/100	○	○	○L	○	○	26.5	
MPLN-BD	5/10/20/50/100	○	○				22	
WLI100XMRTC	100X	○					22	Mirau objective

*1 U-DICR DIC prism: UM/LM position fixed.
*2 40X: BF only *3 5–20X: UV excitation also possible. *4 50X: UV excitation also possible.
Observation method: 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. Evident guarantees* the optical performance (correction for wavefront aberration) with a Strehl ratio** of 95% or better. These objectives can be used with the BXC-FSU autofocus sensing unit.

● **MPLAPON100X02: M Plan Apochromat — p. 3-2**
This plan-apochromat objective is designed for oil immersion*** and features a numerical aperture of 1.45. The objective provides excellent chromatic aberration correction and high resolving power.

● **MXPLFLN series: MX Plan Semi Apochromat — p. 3-3**
MX plan semi-apochromat objectives combine an improved numerical aperture with a long distance. Their 3 mm working distance enables users to move the stage with less chance of the objective hitting the sample, improving wafer inspection throughput.

● **MPLFLN series: M Plan Semi Apochromat — p. 3-4**
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. 3-5**
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. 3-6**
Plan achromat objectives provide excellent image flatness up to OFN22.

● **LCPLFLN-LCD series: LCD Long Working Distance LC Plan Semi Apochromat — p. 3-7**
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. 3-8**
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. 3-9**
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 LC Plan Achromat — p. 3-10**
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. 3-11**
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.

● **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 OFN22.

● **WLI100XMRTC: 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 Evident 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.*

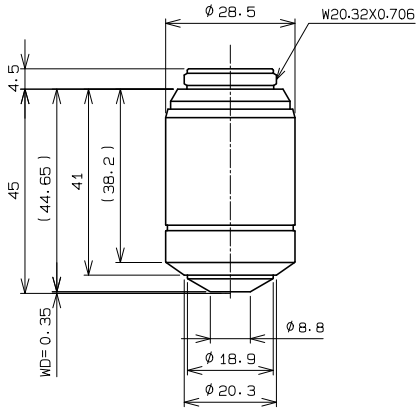
****Specified oil: IMMOIL-F30CC*

M Plan Apochromat

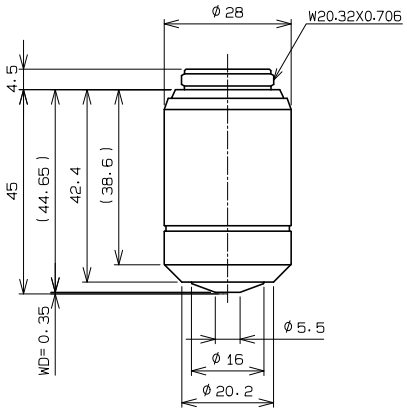
MPLAPON series

This series of plan-apochromat objectives corrects chromatic aberrations at optimal levels. Evident guarantees* the optical performance (correction for wavefront aberration) with a Strehl ratio** of 95% or better. These objectives can be used with the BXC-FSU autofocus sensing unit.

MPLAPON50X



MPLAPON100X



* *Measurement guarantee assessed with an Evident 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

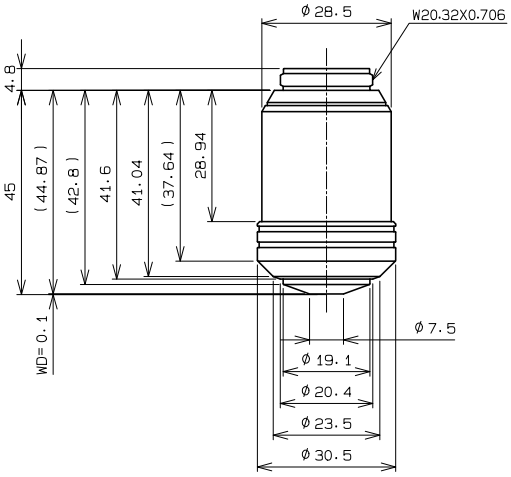
UIS2 Objectives					Widefield Eyepiece WHN10X FN 22			Super Widefield Eyepiece SWH10X FN 26.5		
Objective (magnification)	NA	W.D. (mm)	Focal Length f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Field (µm)	Total Magnification	Practical Field of View (mm)	Depth of Field (µm)
MPLAPON50X	0.95	0.35	3.6	190	500	0.44	1	500	0.53	1
MPLAPON100X	0.95	0.35	1.8	124	1000	0.22	0.67	1000	0.27	0.67

M Plan Apochromat

MPLAPON100XO2

This plan-apochromat objective is designed for oil immersion*** and features a numerical aperture of 1.45. The objective provides excellent chromatic aberration correction and high resolving power.

MPLAPON100XO2



*** *Specified Oil: IMMOIL-F30CC*

Unit: mm

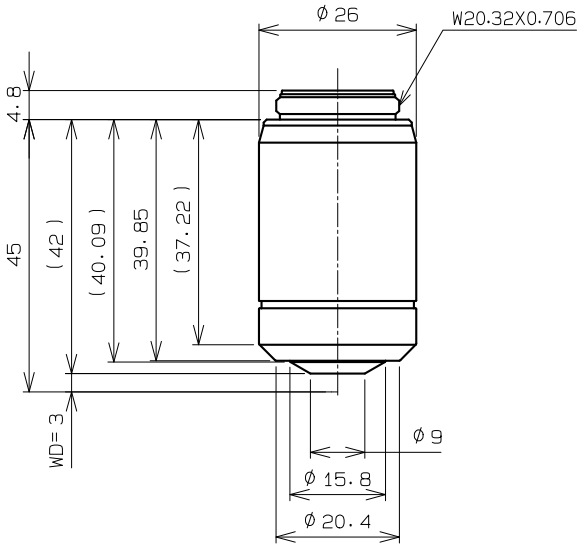
UIS2 Objectives					Widefield Eyepiece WHN10X FN 22			Super Widefield Eyepiece SWH10X FN 26.5		
Objective (magnification)	NA	W.D. (mm)	Focal Length f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Field (µm)	Total Magnification	Practical Field of View (mm)	Depth of Field (µm)
MPLAPON100XO2	1.45	0.1	1.8	163	1000	0.22	0.56	1000	0.27	0.34

MX Plan Semi Apochromat

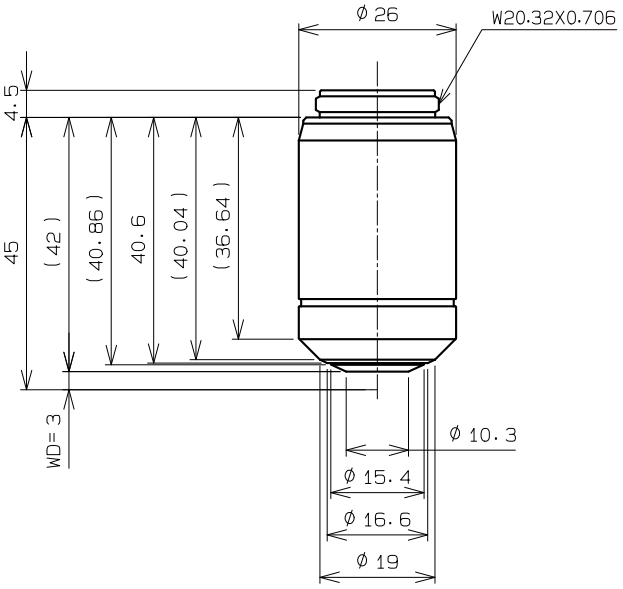
MXPLFLN series, MXPLFLN-BD series

MX plan semi-apochromat objectives combine an improved numerical aperture with a long distance. Their 3 mm working distance enables users to move the stage with less chance of the objective hitting the sample, improving wafer inspection throughput.

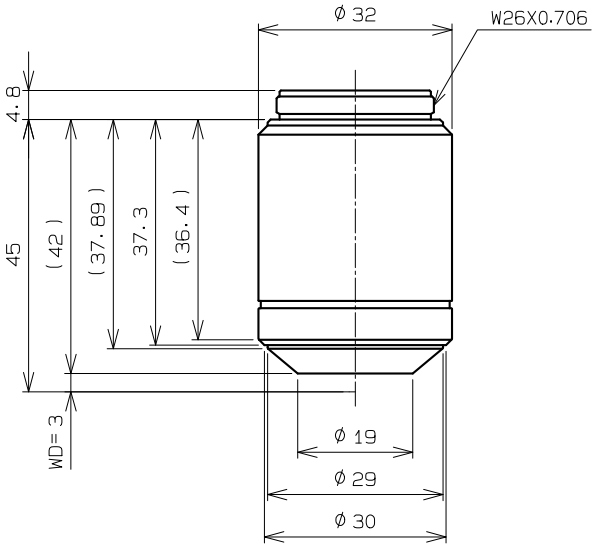
MXPLFLN20X



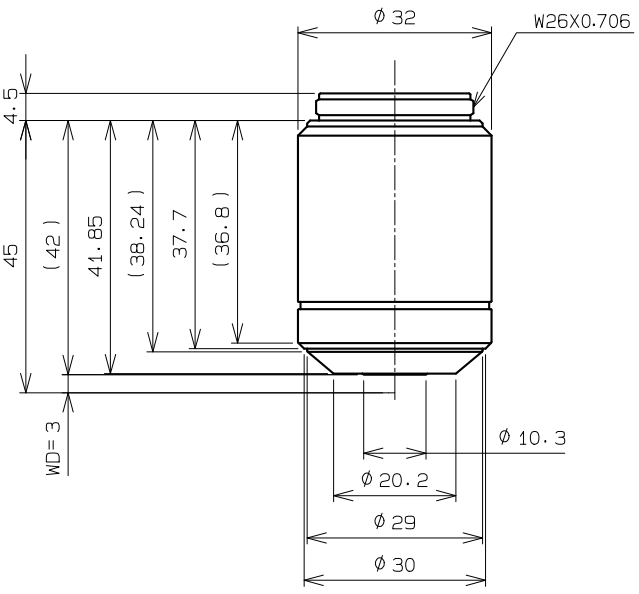
MXPLFLN50X



MXPLFLN20XBD



MXPLFLN50XBD



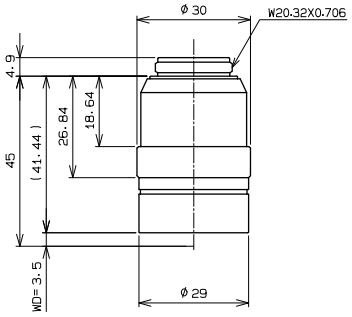
UIS2 Objectives					Widefield Eyepiece WHN10X FN 22			Super Widefield Eyepiece SWH10X FN 26.5		
Objective (magnification)	NA	W.D. (mm)	Focal Length f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Field (μm)	Total Magnification	Practical Field of View (mm)	Depth of Field (μm)
MXPLFLN20X	0.6	3	9	109	200	1.1	3.7	200	1.3	3.7
MXPLFLN50X	0.8	3	3.6	99	500	0.44	1.3	500	0.53	1.3
MXPLFLN20XBD	0.55	3	9	110	200	1.1	4.1	200	1.3	4.1
MXPLFLN50XBD	0.8	3	3.6	107	500	0.44	1.3	500	0.53	1.3

M Plan Semi Apochromat

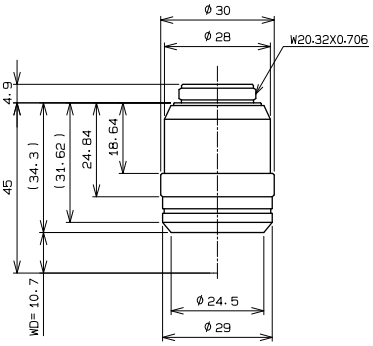
MPLFLN series

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.

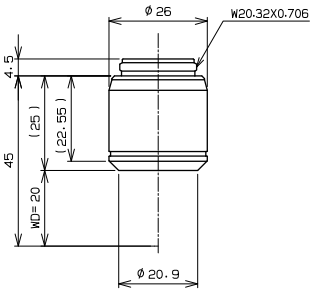
MPLFLN1.25X



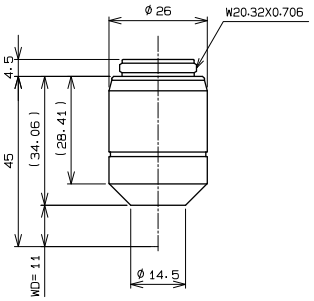
MPLFLN2.5X2



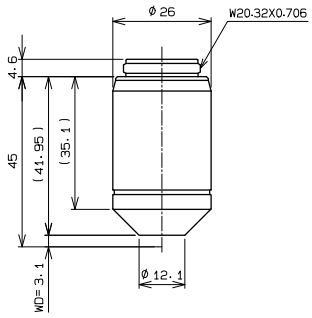
MPLFLN5X2



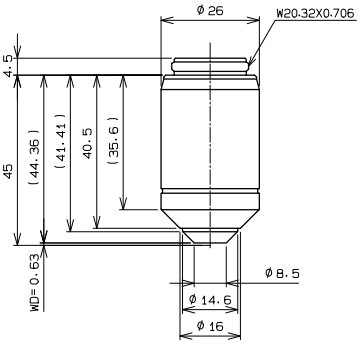
MPLFLN10X



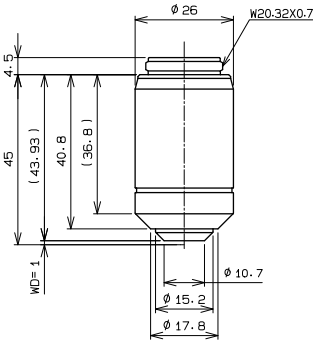
MPLFLN20X



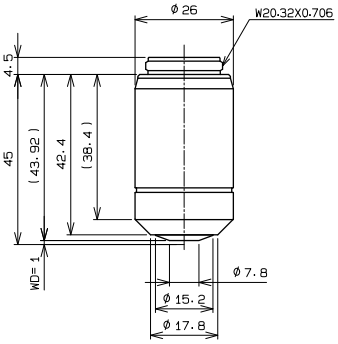
MPLFLN40X



MPLFLN50X



MPLFLN100X



Unit: mm

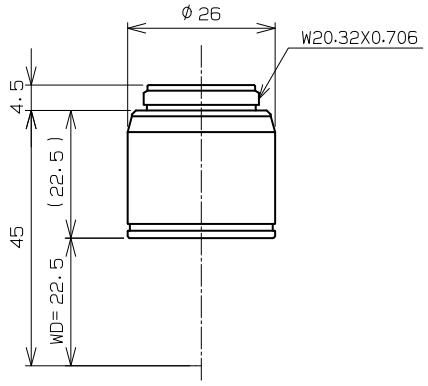
UIS2 Objectives					Widefield Eyepiece WHN10X FN 22			Super Widefield Eyepiece SWH10X FN 26.5		
Objective (magnification)	NA	W.D. (mm)	Focal Length f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Field (μm)	Total Magnification	Practical Field of View (mm)	Depth of Field (μm)
MPLFLN1.25X	0.04	3.5	144	122	12.5	17.6	870	—	—	—
MPLFLN2.5X2	0.08	10.7	72	106	25	8.8	220	25	10.6	220
MPLFLN5X2	0.15	20	36	52	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	5.2
MPLFLN40X	0.75	0.63	4.5	120	400	0.55	1.7	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

Long Working Distance M Plan Semi Apochromat

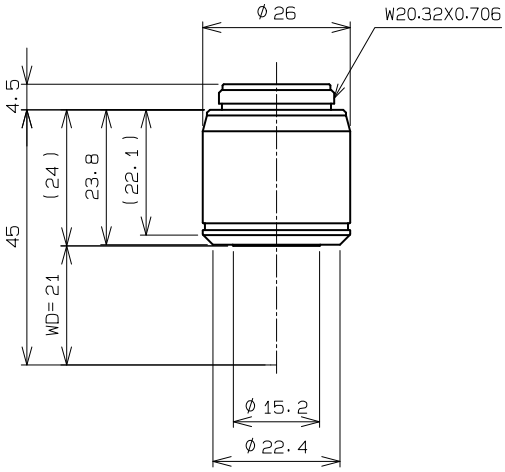
LMPLFLN series

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.

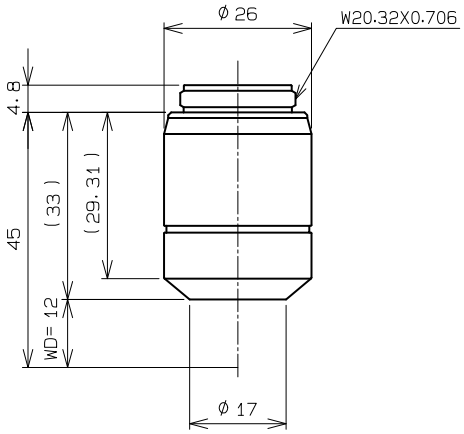
LMPLFLN5X



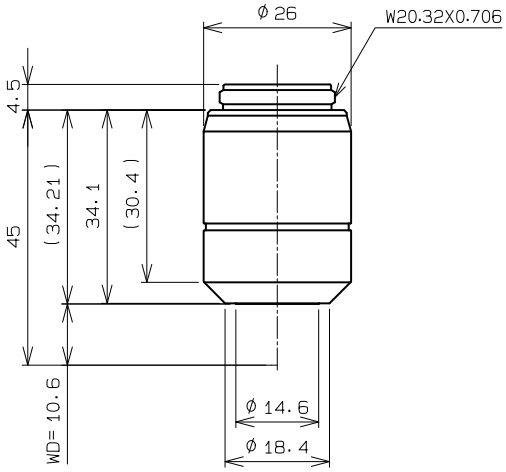
LMPLFLN10X



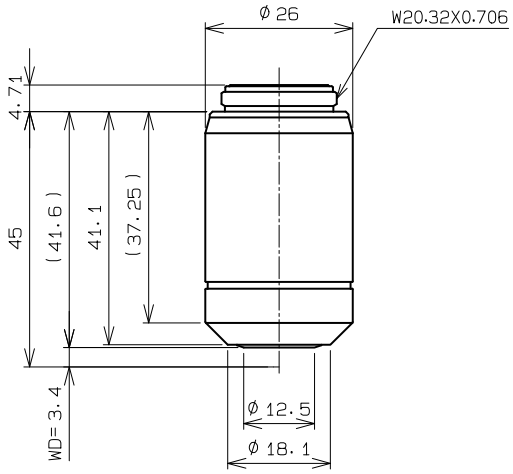
LMPLFLN20X



LMPLFLN50X



LMPLFLN100X



Unit: mm

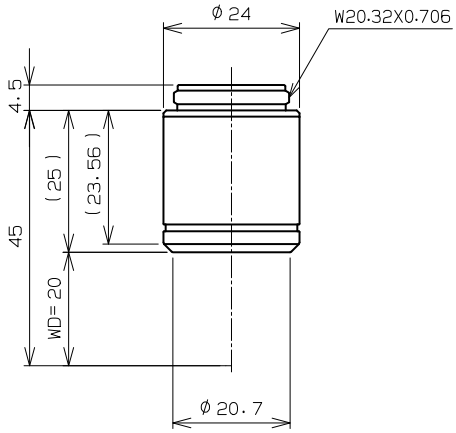
UIS2 Objectives					Widefield Eyepiece WHN10X FN 22			Super Widefield Eyepiece SWH10X FN 26.5		
Objective (magnification)	NA	W.D. (mm)	Focal Length f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Field (μm)	Total Magnification	Practical Field of View (mm)	Depth of Field (μm)
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

M Plan Achromat

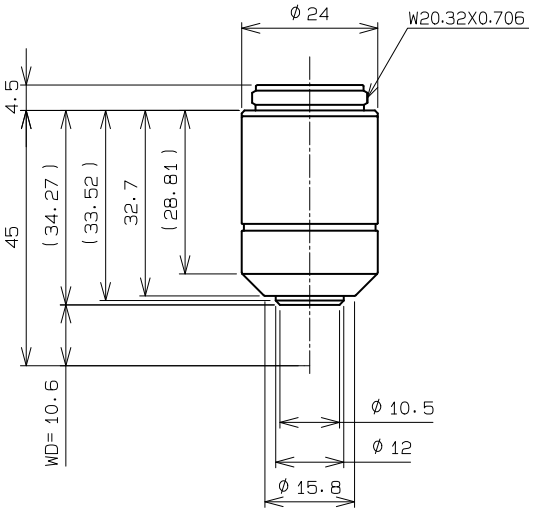
MPLN series

Plan achromat objectives provide excellent image flatness up to OFN22.

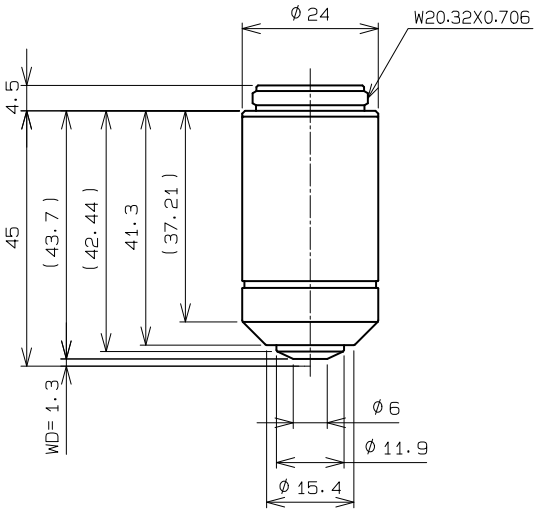
MPLN5X



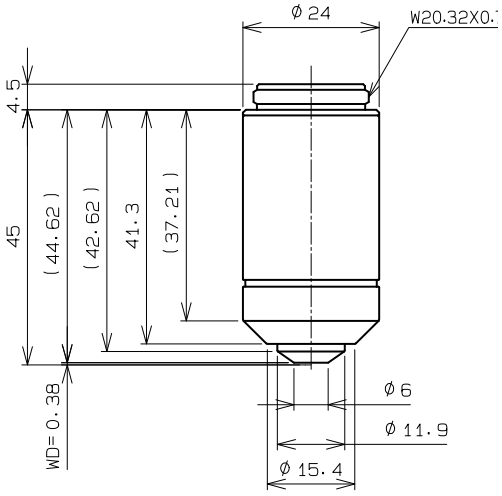
MPLN10X



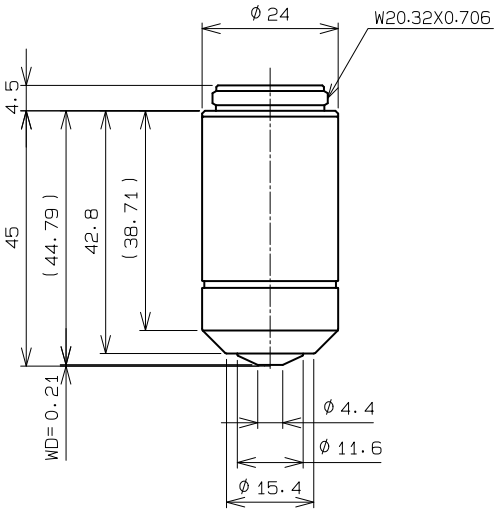
MPLN20X



MPLN50X



MPLN100X



Unit: mm

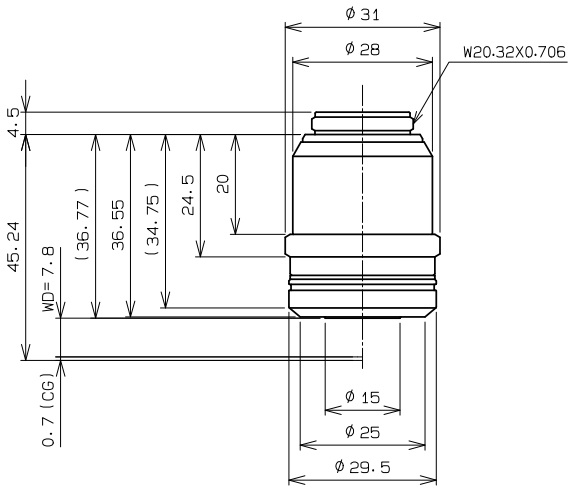
UIS2 Objectives					Widefield Eyepiece WHN10X FN 22		
Objective (magnification)	NA	W.D. (mm)	Focal Length f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Field (μm)
MPLN5X	0.1	20	36	64	50	4.4	98
MPLN10X	0.25	10.6	18	80	100	2.2	18
MPLN20X	0.4	1.3	9	111	200	1.1	6.1
MPLN50X	0.75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

LCD Long Working Distance LC Plan Semi Apochromat

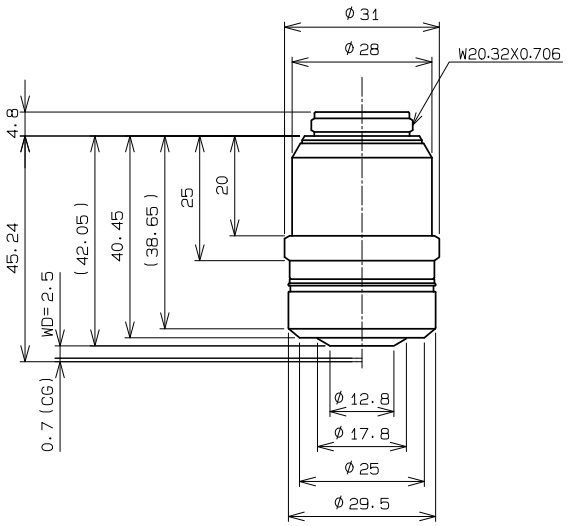
LCPLFLN-LCD series

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.

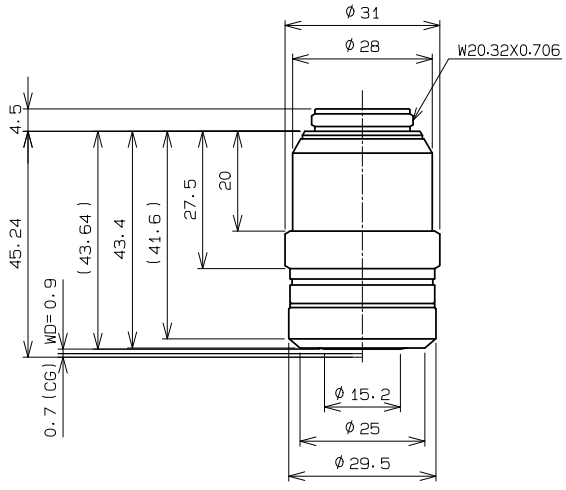
LCPLFLN20XLCD



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 Length f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Field (μm)	Total Magnification	Practical Field of View (mm)	Depth of Field (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	186	1000	0.22	0.79	1000	0.27	0.79

**Value when the correction collar indication is 0.7.

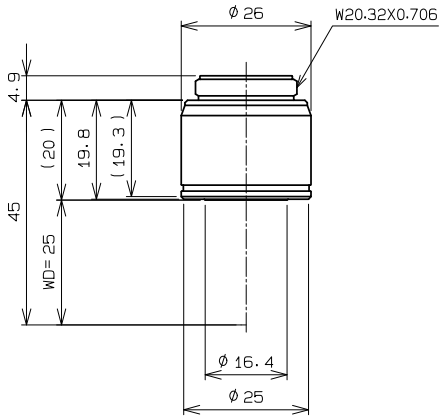
Super Long Working Distance M Plan Achromat

SLMPLN series

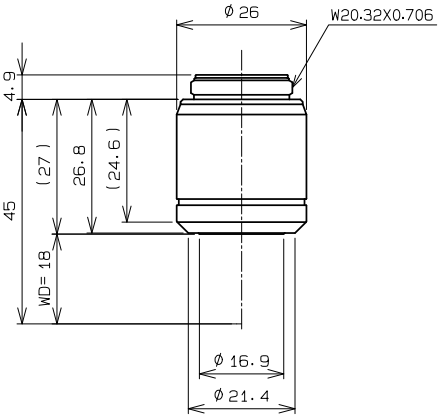
UIS2 World-leading optics

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.

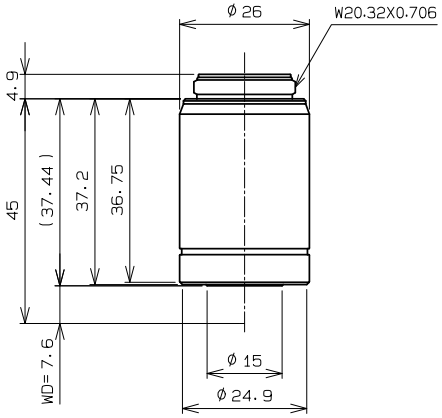
SLMPLN20X



SLMPLN50X



SLMPLN100X



Unit: mm

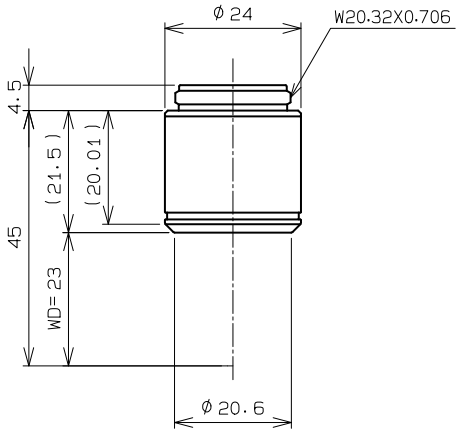
UIS2 Objectives					Widefield Eyepiece WHN10X FN 22			Super Widefield Eyepiece SWH10X FN 26.5		
Objective (magnification)	NA	W.D. (mm)	Focal Length f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Field (μm)	Total Magnification	Practical Field of View (mm)	Depth of Field (μm)
SLMPLN20X	0.25	25	9	56	200	1.1	11	200	1.3	11
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

IR Long Working Distance M Plan Achromat

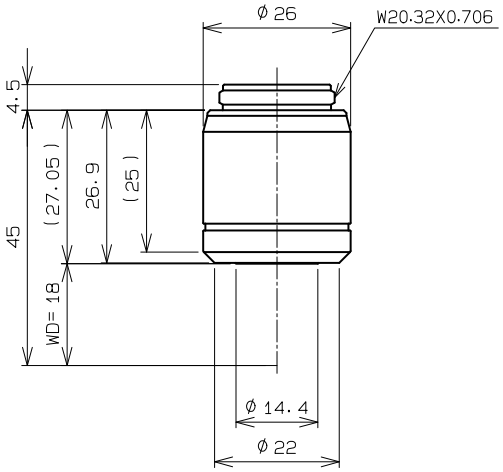
LMPLN-IR series

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

LMPLN5XIR



LMPLN10XIR



Unit: mm

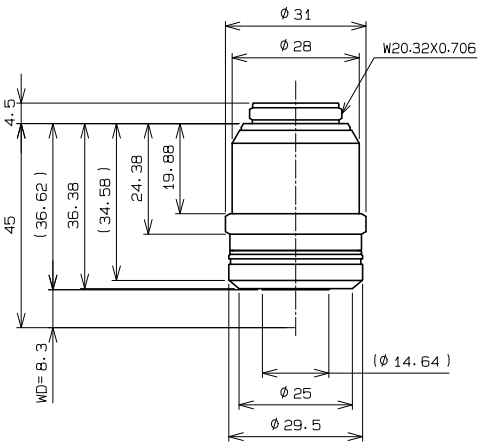
UIS2 Objectives				
Objective (magnification)	NA	W.D. (mm)	Focal Length f (mm)	Weight (g)
LMPLN5XIR	0.1	23	36	55
LMPLN10XIR	0.3	18	18	78

IR LC Plan Achromat

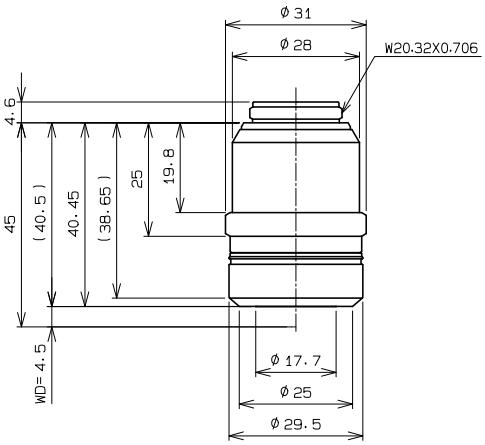
LCPLN-IR series

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.

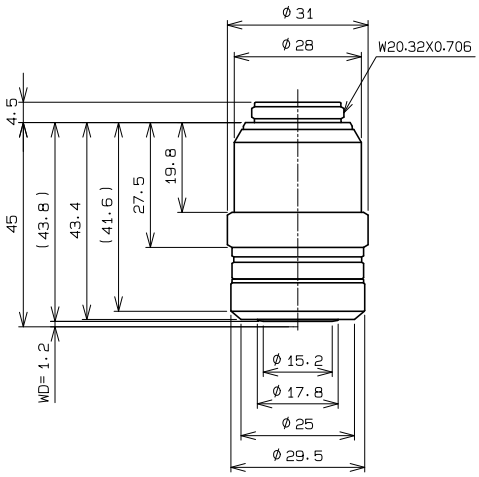
LCPLN20XIR



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	LCPLN20XIR			LCPLN50XIR		LCPLN100XIR	
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 Length 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

*Value when the correction collar indication is 0.

M Plan Semi Apochromat BD

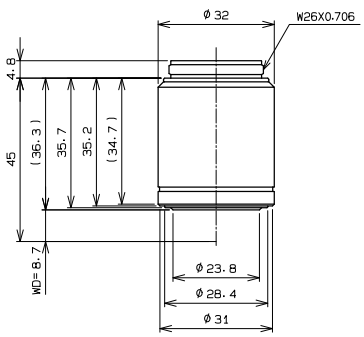
(BD: Brightfield/Darkfield)

MPLFLN-BD series

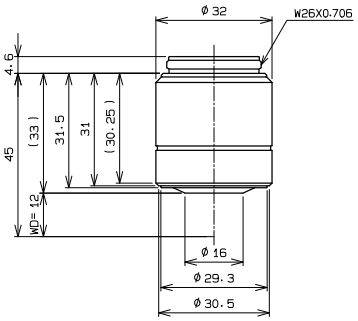
UIS2 World-leading optics

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 2.5X–150X objectives is standardized, the position of the DIC prism does not have to be switched when changing the magnification.

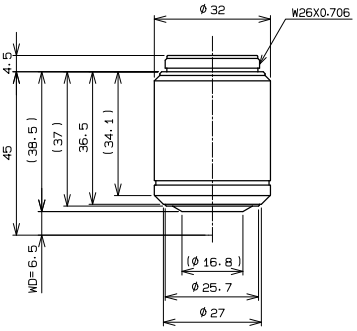
MPLFLN2.5XBD



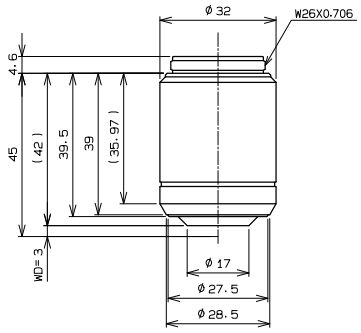
MPLFLN5XBD2



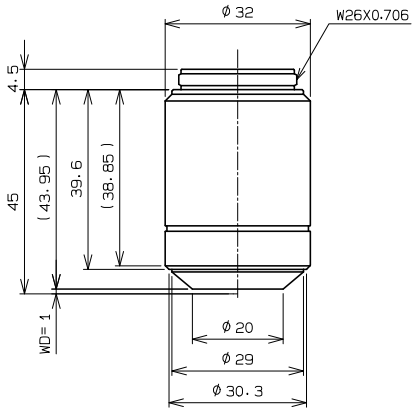
MPLFLN10XBD



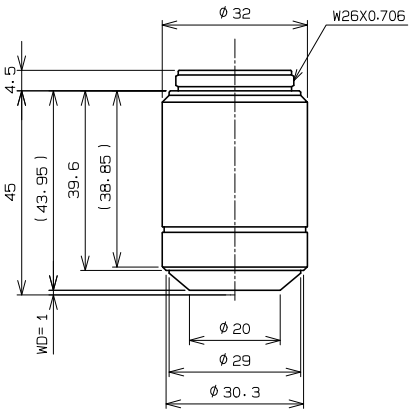
MPLFLN20XBD



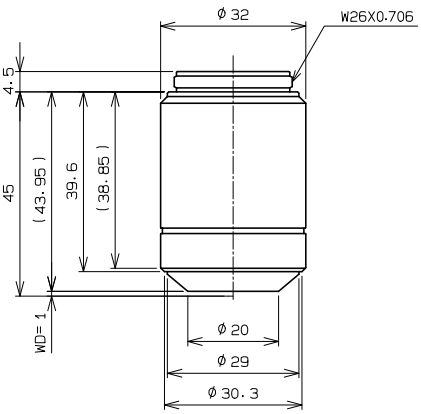
MPLFLN50XBD



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 Length f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Field (µm)	Total Magnification	Practical Field of View (mm)	Depth of Field (µm)
MPLFLN2.5XBD	0.08	8.7	72	81	25	8.8	220	25	10.6	220
MPLFLN5XBD2	0.15	12	36	96	50	4.4	59	50	5.3	59
MPLFLN10XBD	0.3	6.5	18	83	100	2.2	15	100	2.7	15
MPLFLN20XBD	0.45	3	9	88	200	1.1	5.2	200	1.3	5.2
MPLFLN50XBD	0.8	1	3.6	100	500	0.44	1.3	500	0.53	1.3
MPLFLN100XBD	0.9	1	1.8	99	1000	0.22	0.73	1000	0.27	0.73
MPLFLN150XBD	0.9	1	1.2	105	1500	0.15	0.6	1500	0.18	0.6

Long Working Distance M Plan Semi Apochromat BD

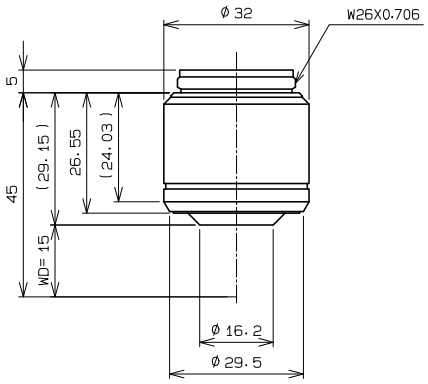
(BD: Brightfield/Darkfield)

LMPLFLN-BD series

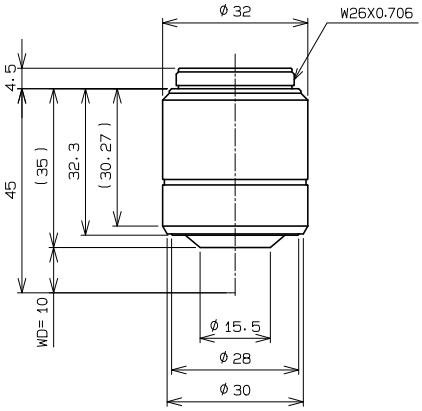
UIS2 World-leading optics

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.

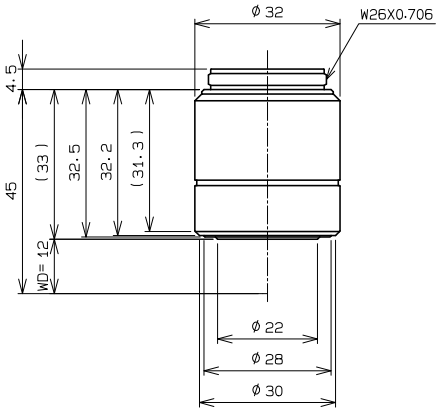
LMPLFLN5XBD



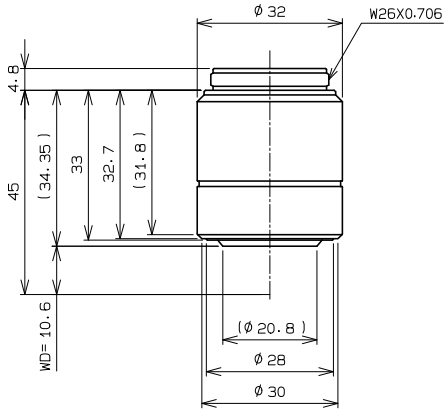
LMPLFLN10XBD



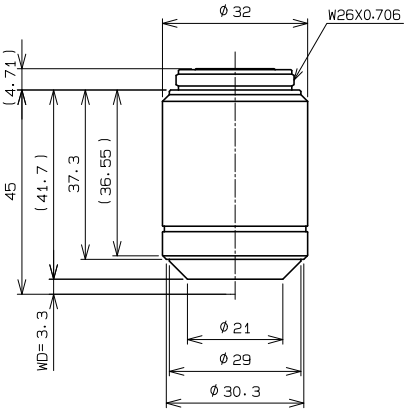
LMPLFLN20XBD



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 Length f (mm)	Weight (g)	Total Magnification	Practical Field of View (mm)	Depth of Field (μm)	Total Magnification	Practical Field of View (mm)	Depth of Field (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

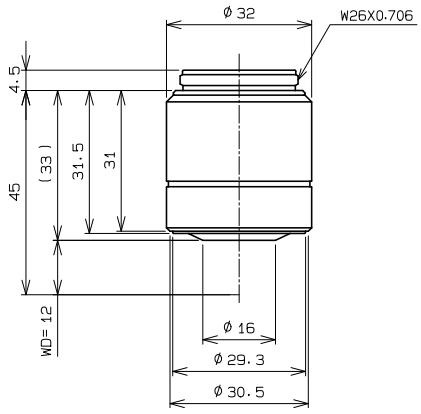
M Plan Achromat BD

(BD: Brightfield/Darkfield)

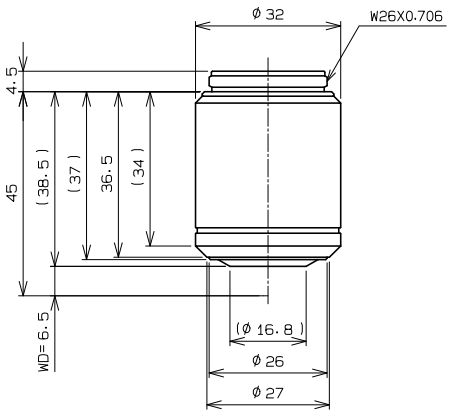
MPLN-BD series

This series of plan achromat objectives provides excellent image flatness up to OFN22.

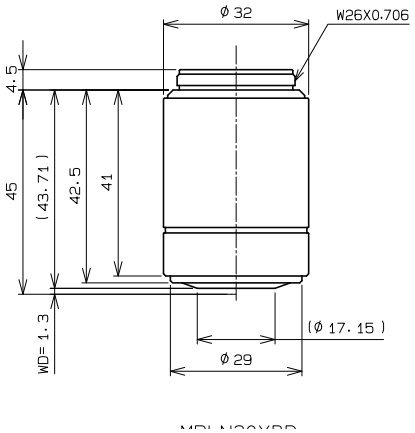
MPLN5XBD



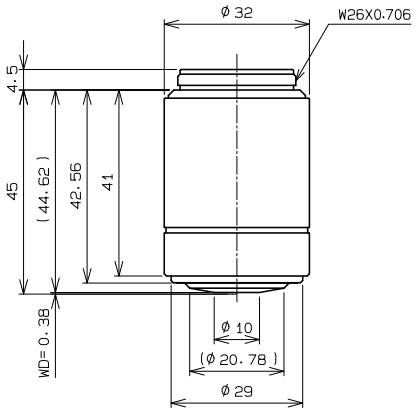
MPLN10XBD



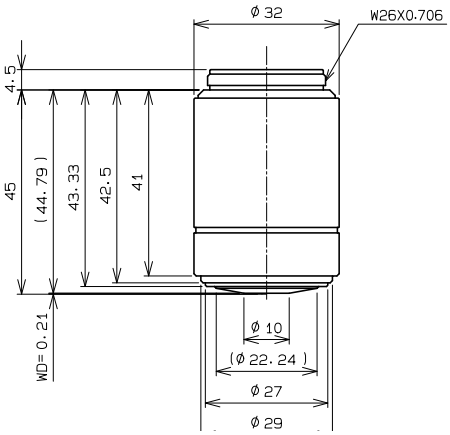
MPLN20XBD



MPLN50XBD



MPLN100XBD



Unit: mm

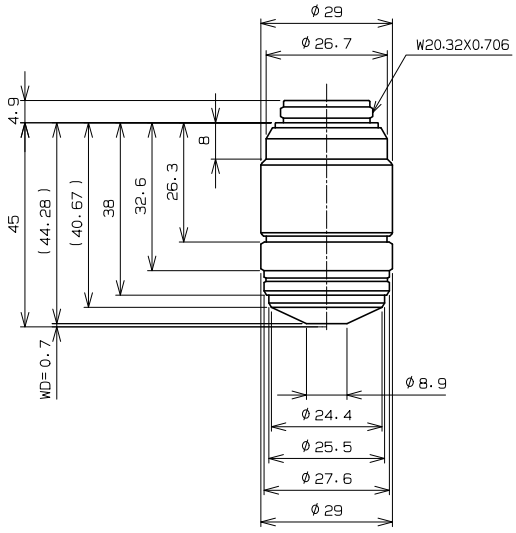
UIS2 Objectives					Widefield Eyepiece WHN10X FN 22		
Objective (magnification)	NA	W.D. (mm)	Focal Length f (mm)	Weight (g)	Total Magnifications	Practical Field of View (mm)	Depth of Field (μm)
MPLN5XBD	0.1	12	36	137	50	4.4	98
MPLN10XBD	0.25	6.5	18	154	100	2.2	18
MPLN20XBD	0.4	1.3	9	162	200	1.1	6.1
MPLN50XBD	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

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.

WLI100XMRTC



Unit: mm

Objective (magnification)	NA	W.D. (mm)	Weight (g)	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence	OFN
WLI100XMRTC	0.8	0.7	169	0	—	—	—	22.0

UIS2 Objectives for Life Science Applications

Objective Abbreviations Guide

U PL (Plan) FL N 60X OI PH

U: Universal objectives for fluorescence (U/BG) and DIC
L: Long working distance
C: Tissue culture observations through bottles and dishes
M: For no cover observation
***XL:** Extra large; parfocal length exceeds 45 mm (e.g. XLUMPLFL20XW 75 mm)

PL (or PLN): Plan: Corrects field curvature of the periphery on the image plane
None: Non-Plan

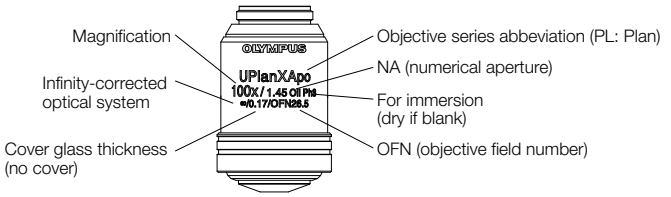
ACH: Achromat/ Effectively corrects chromatic aberration at 486 nm and 656 nm wavelengths
FLN: Semi-apochromat/ Corrects chromatic aberration that is in the middle of apochromat and achromat
APO: Apochromat/ Effectively corrects chromatic aberration in the entire visible range (435-656 nm)
SAPO: Super apochromat/ Effectively corrects chromatic aberration in the visible to near infrared range (435-1000 nm)
XAPO: Extended apochromat/ Effectively corrects chromatic aberration in the visible to infrared range (400 to 1000 nm)

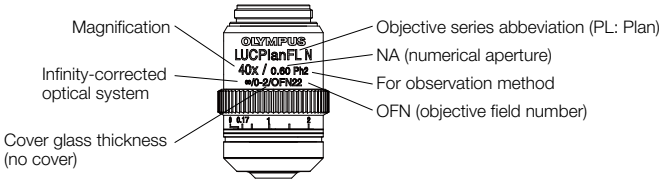
Number: Objective magnification

None: Dry
O: Oil immersion
W: Water immersion
S: Silicone immersion
OI: Oil immersion with iris

None: Brightfield
P: Polarizing
PH: Phase contrast
PHP: Pre-centered phase contrast
RC: Relief contrast
340 : High-transmission at 340 nm wavelength

Objective Notation





Objective Series List

Objective series for standard biological samples

Series	Magnification	BF	DF	DIC*	POL	FL	OFN (Objective Field Number)	Remarks
UPLXAPO	4X/10X/20X/40X/40XO/60XO/100XO	○	10X/20X	○ (except 4X)	○	○	26.5	
UPLSAPO	60XW	○		○	○	○	26.5	
PLAPON	1.25X/2X	○					26.5	
UPLFLN	4X/10X2/20X/40X/40XO/60X/60XOI/100XO2/100XOI2	○	10X2/20X/40X/60XOI/100XOI2	○ (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/10X2PH/20XPH/40XPH/60XOIPH/100XO2PH	○	10X2PH/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	

*These objectives are suitable for standard biological samples embeded 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	OFN (Objective Field Number)	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	OFN (Objective Field Number)	Remarks
LUMPLFLN/ UMPLFLN	10XW/20XW/40XW/60XW	○	10XW/20XW	○	○	○	26.5	
XLUMPLFLN	20XW	○		○		○	22	Perocal length 75 mm
APON 340	20XW/40XO/40XW	○	20XW/40XW	○	○	○	22	

Features of Each Objective Series

Please refer to the following pages for details on each objective.

- UPLXAPO: Extended Apochromat — p. 3-16
- UPLSAPO: Universal Plan Super Apochromat — p. 3-17
- 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 UPlanFl-P Universal Plan Semi Apochromat for Phase Contrast — p. 3-23
- PLN-PH: Plan Achromat for Phase Contrast — p. 3-24
- UPLFLN-P: UPlanFl-P Universal Plan Semi Apochromat for Polarization. — p. 3-25
- PLN/ACHN-P: Achromat for Polarization. — p. 3-26
- LUCPLFLN, UCPLFLN: Long Working Distance Universal Plan Semi Apochromat — p. 3-27
- LUCPLFLN/UCPLFLN-RC: Long Working Distance Universal Plan Semi Apochromat for Relief Contrast — p. 3-28
- LUCPLFLN/UCPLFLN-PH: Long Working Distance Universal Plan Semi Apochromat for Phase Contrast — p. 3-29
- CPLN/LCACHN-PH: Culture Specimen Objectives for Phase Contrast — p. 3-30
- CPLN/LCACHN-RC: Culture Specimen Objectives for Relief Contrast — p. 3-31
- LUMPLFLN/UMPLFLN: No Cover Water Immersion for Fixed Stage Upright Microscope — p. 3-32
- XLUMPLFLN: No Cover Water Immersion for Fixed Stage Upright Microscope — p. 3-33
- APON 340: Universal Apochromat — p. 3-34

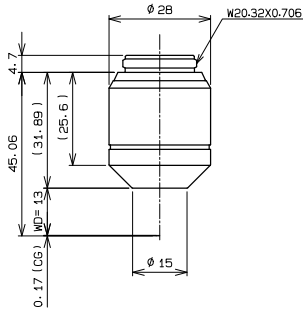
Extended Apochromat Objectives

UPLXAPO series

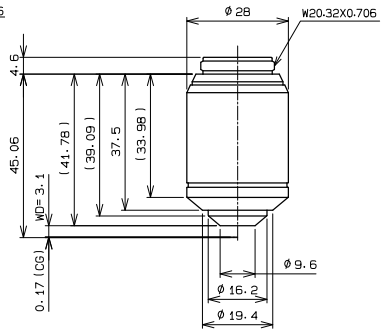
UIS2 World-leading optics

The UPLXAPO extended apochromat objectives have a high numerical aperture (NA), wide homogeneous image flatness, and an extended range of chromatic aberration compensation from 400 nm to 1000 nm. These features enable you to acquire high-resolution, bright images for a wide range of applications from brightfield/fluorescence microscopy to confocal /super resolution microscopy.

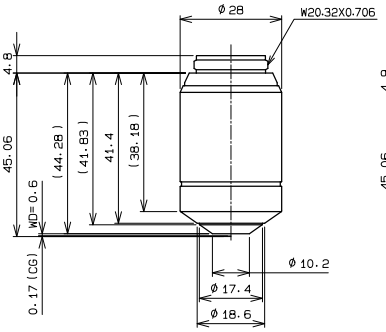
UPLXAPO4X



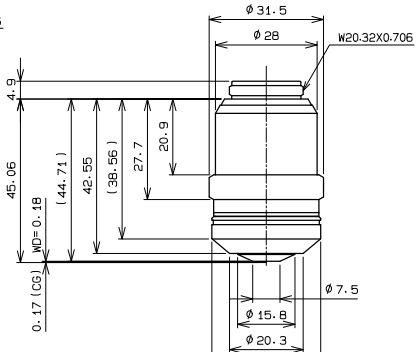
UPLXAPO10X



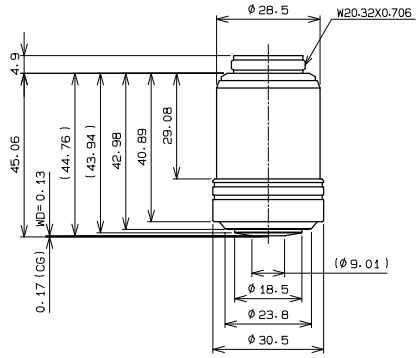
UPLXAPO20X



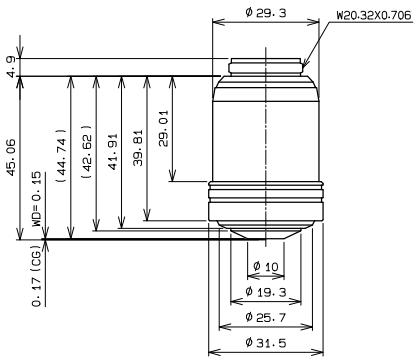
UPLXAPO40X



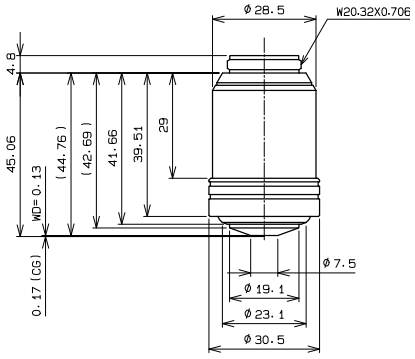
UPLXAPO40XO



UPLXAPO60XO



UPLXAPO100XO



Unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Weight (g)	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	OFN
UPLXAPO4X	0.16	13.0	107	—	—	—	U/BG	26.5
UPLXAPO10X	0.40	3.1	141	0.17	—	—	U/BG	26.5
UPLSAPO20X	0.8	0.6	149	0.17	—	Yes	U/BG	26.5
UPLXAPO40X	0.95	0.18	168	0.11-0.23	—	Yes	U/BG	26.5
UPLXAPO40XO	1.40	0.13	162	0.17	Oil	Yes	U/BG	26.5
UPLXAPO60XO	1.42	0.15	166	0.17	Oil	Yes	U/BG	26.5
UPLXAPO100XO	1.45	0.13	161	0.17	Oil	Yes	U/BG	26.5

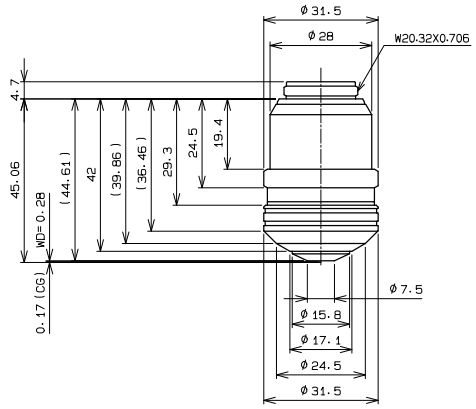
*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV excitation, BG: visible excitation. "( )" indicates that fluorescence might be slightly darker.

Universal Plan Super Apochromat

UPLSAPO series

The UPLSAPO super apochromat objective fully compensates 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. This objective series meets the quality and performance needs of versatile digital imaging applications.

UPLSAPO60XW



Unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Weight (g)	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	OFN
UPLSAPO60XW	1.20	0.28	162	0.13-0.21	Water	Yes	U/BG	26.5

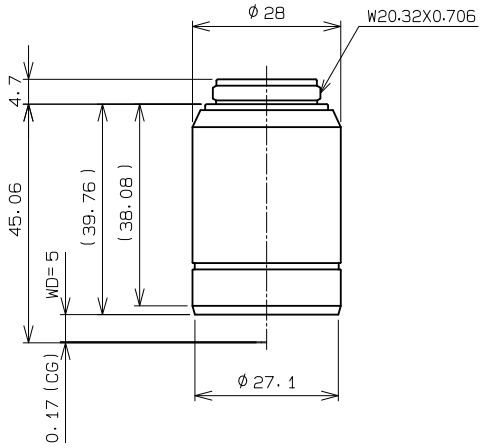
*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV excitation, BG: visible excitation. "( )" indicates that fluorescence might be slightly darker.

Plan Apochromat

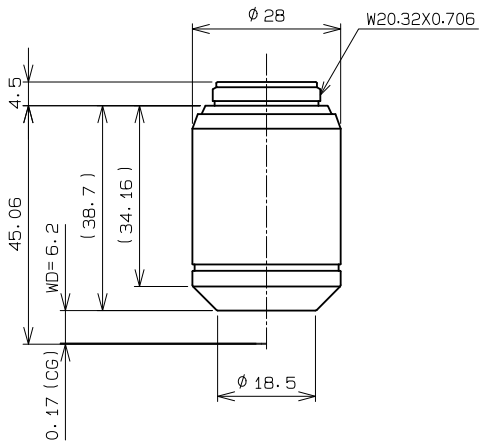
PLAPON series

The PLAPON apochromat objectives display flat images from violet to the near-infrared region of the spectrum. This objective series meets the quality and performance needs of versatile digital imaging applications.

PLAPON1.25X



PLAPON2X



Unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Weight (g)	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	OFN
PLAPON1.25X	0.04	5.0	146	—	—	—	(BG)	26.5
PLAPON2X	0.08	6.2	118	—	—	—	(BG)	26.5

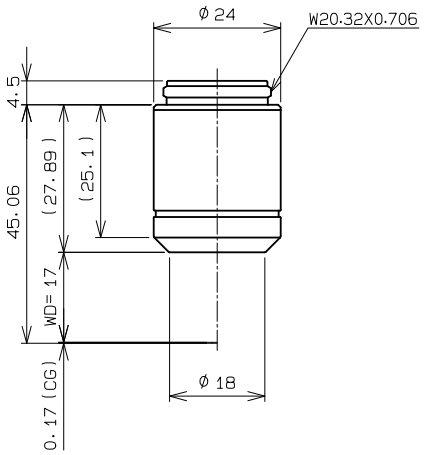
*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV excitation, BG: visible excitation. "( )" indicates that fluorescence might be slightly darker.

Universal Plan Semi Apochromat/Plan Semi Apochromat

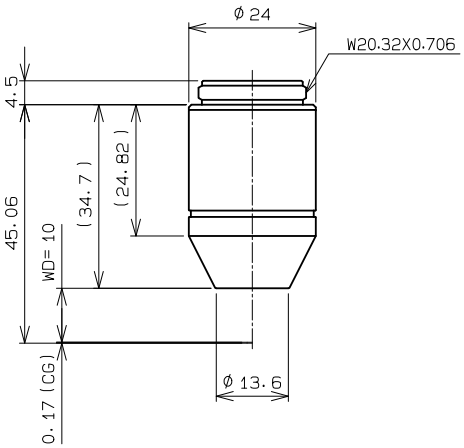
UPLFLN, PLFLN series

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, resolution, and contrast, they are especially effective in brightfield and Nomarski DIC observations. This objective series meets the quality and performance needs of versatile digital imaging applications.

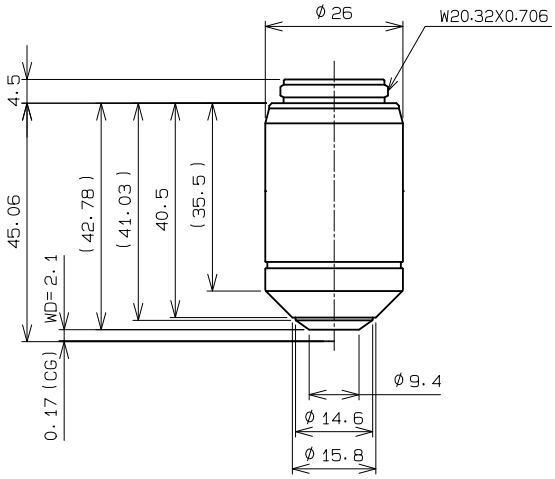
UPLFLN4X



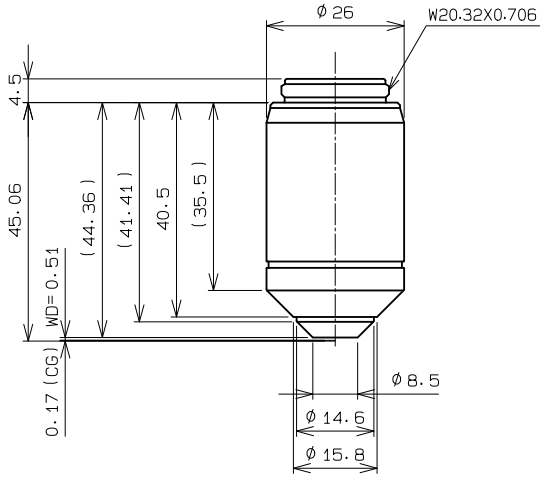
UPLFLN10X2



UPLFLN20X



UPLFLN40X



Unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Weight (g)	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	OFN
UPLFLN4X	0.13	17	81	—	—	—	U/BG	26.5
UPLFLN10X2	0.30	10	83	—	—	—	U/BG	26.5
UPLFLN20X	0.50	2.1	120	0.17	—	—	U/BG	26.5
UPLFLN40X	0.75	0.51	118	0.17	—	Yes	U/BG	26.5

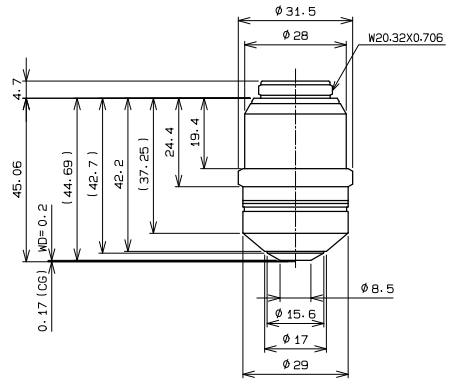
*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV excitation, BG: visible excitation. "( )" indicates that fluorescence might be slightly darker.

Universal Plan Semi Apochromat/Plan Semi Apochromat

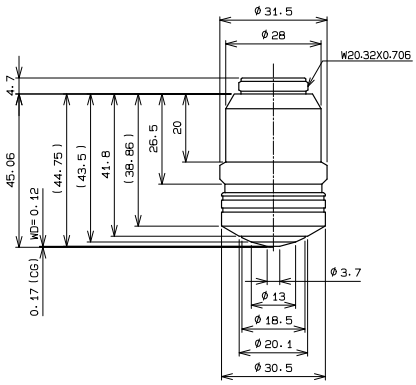
UPLFLN, PLFLN series

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, resolution, and contrast, they are especially effective in brightfield and Nomarski DIC observations. This objective series meets the quality and performance needs of versatile digital imaging applications.

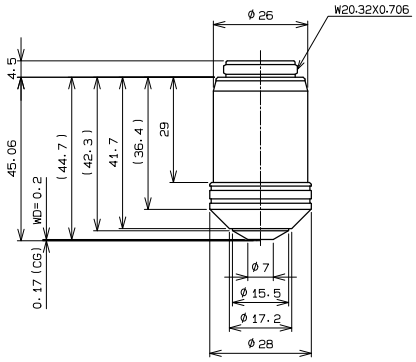
UPLFLN60X



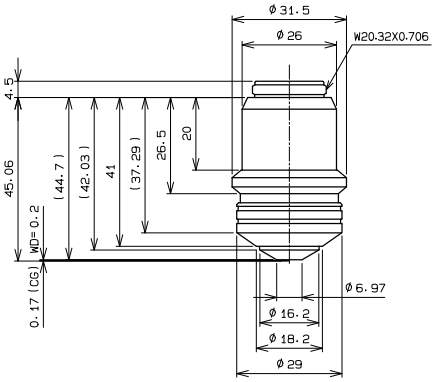
UPLFLN60XOI



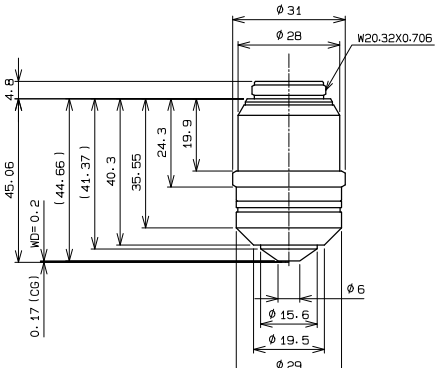
UPLFLN100XO2



UPLFLN100XOI2



PLFLN100X



Unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Weight (g)	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	OFN
UPLFLN60X	0.90	0.2	156	0.11–0.23	—	Yes	U/BG	26.5
UPLFLN60XOI	1.25–0.65	0.12	158	0.17	Oil	Yes	U/BG	26.5
UPLFLN100XO2	1.30	0.2	134	0.17	Oil	Yes	U/BG	26.5
UPLFLN100XOI2	1.3–0.6	0.2	140	0.17	Oil	Yes	U/BG	26.5
PLFLN100X	0.95	0.2	152	0.14–0.2	—	Yes	BG	26.5

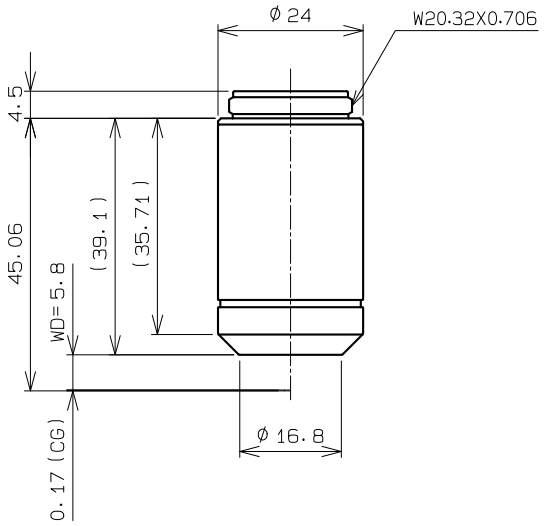
*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV excitation, BG: visible excitation. "( )" indicates that fluorescence might be slightly darker.

Plan Achromat

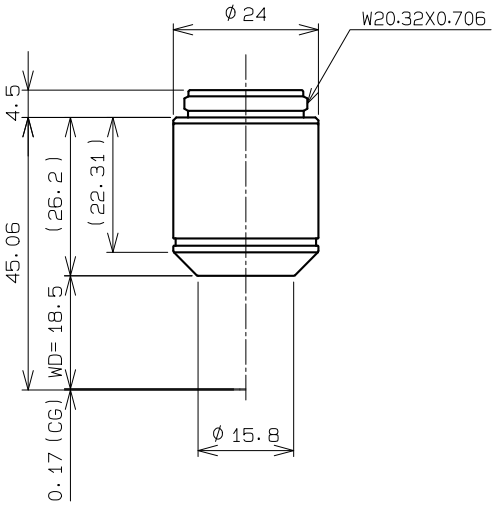
PLN series

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.

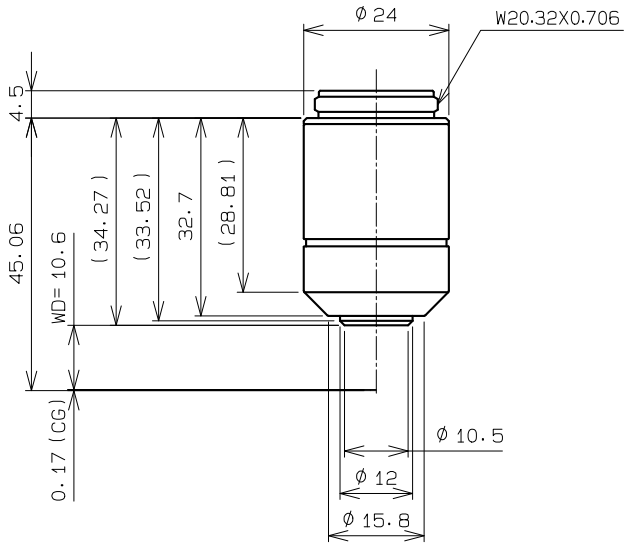
PLN2X



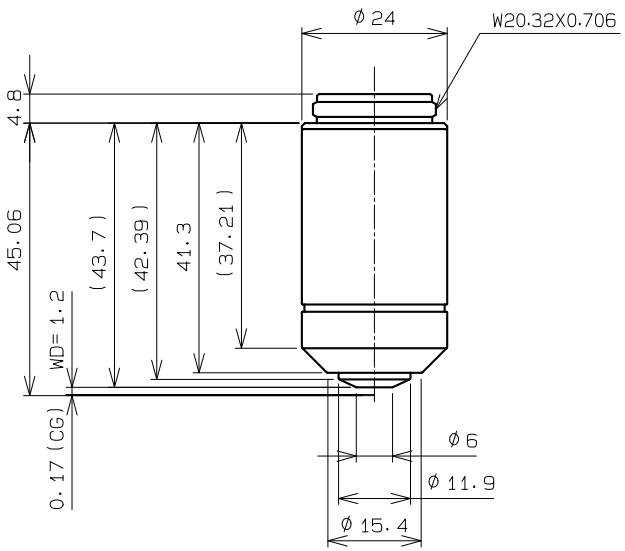
PLN4X



PLN10X



PLN20X



Unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Weight (g)	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	OFN
PLN2X	0.06	5.8	97.9	—	—	—	(BG)	22.0
PLN4X	0.10	18.5	77.5	—	—	—	(BG)	22.0
PLN10X	0.25	10.6	80.1	—	—	—	(BG)	22.0
PLN20X	0.40	1.2	112	0.17	—	Yes	(BG)	22.0

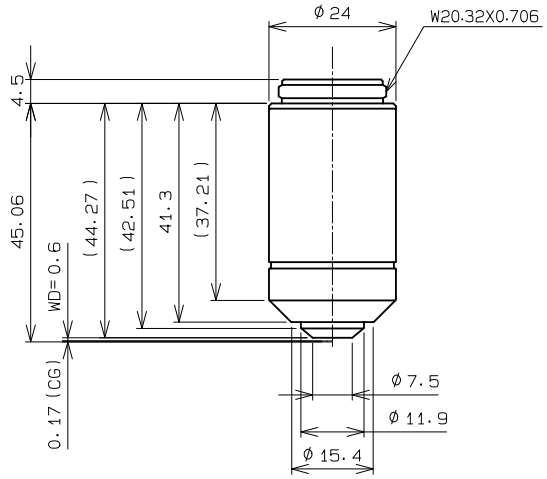
*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV excitation, BG: visible excitation. "( )" indicates that fluorescence might be slightly darker.

Plan Achromat

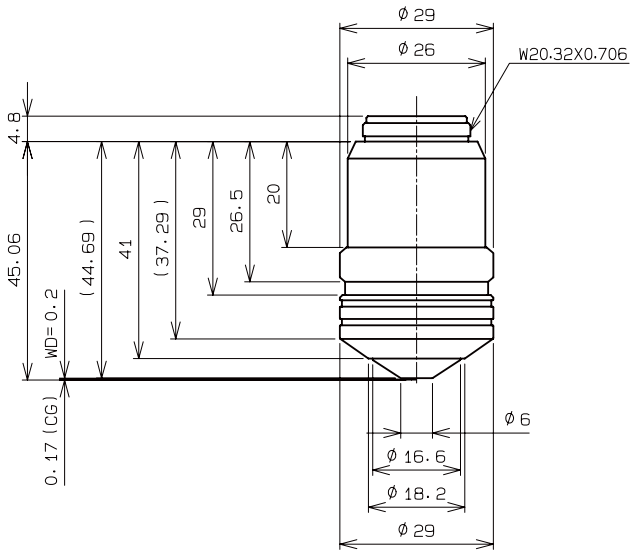
PLN series

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.

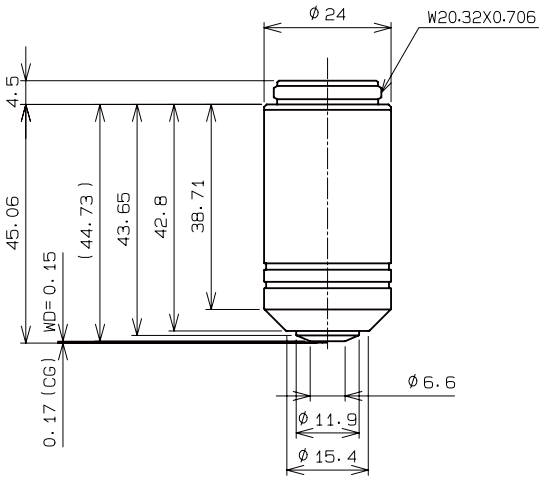
PLN40X



PLN50XOI



PLN100XO



Unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Weight (g)	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	OFN
PLN40X	0.65	0.6	111	0.17	—	Yes	(BG)	22.0
PLN50XOI	0.9–0.5	0.2	150	—	Oil	Yes	(BG)	22.0
PLN100XO	1.25	0.15	114	—	Oil	Yes	(BG)	22.0

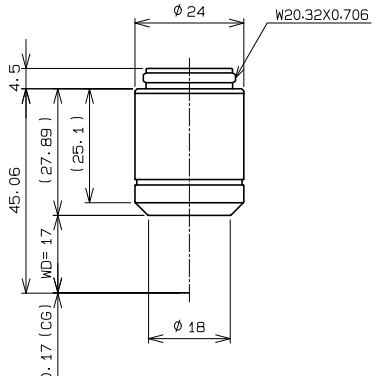
*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV excitation, BG: visible excitation. "( )" indicates that fluorescence might be slightly darker.

Universal Plan Semi Apochromat for Phase Contrast

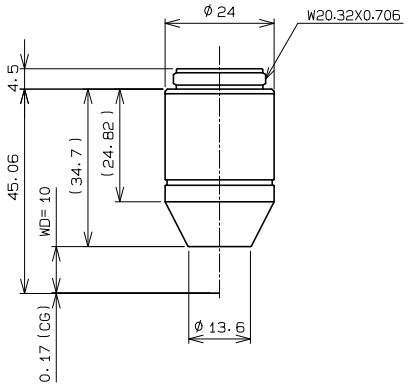
UPLFLN-PH series

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

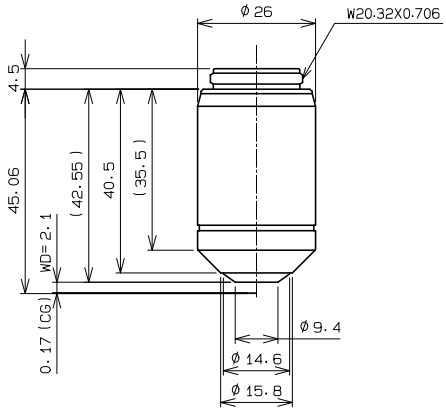
UPLFLN4XPH



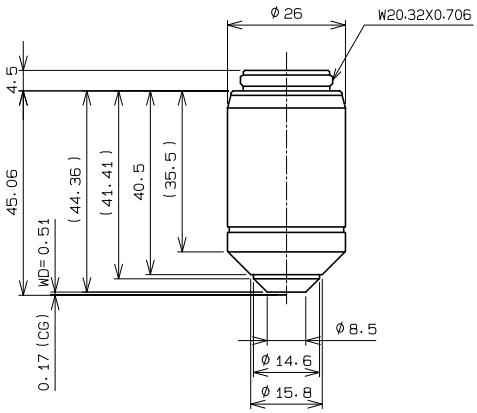
UPLFLN10X2PH



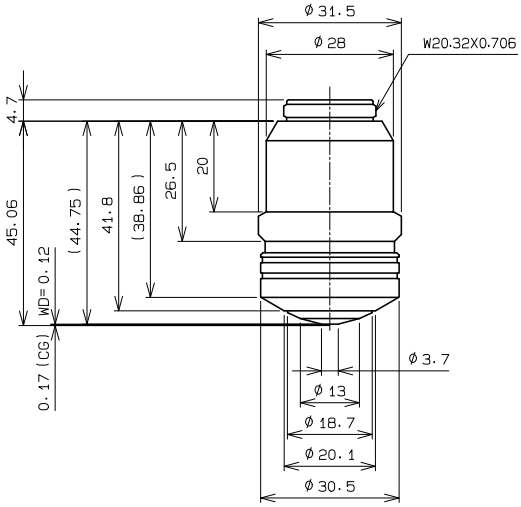
UPLFLN20XPH



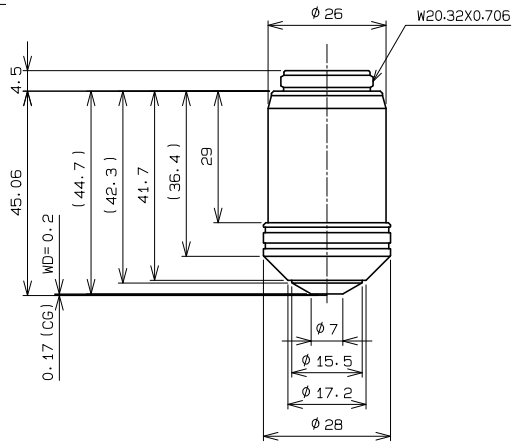
UPLFLN40XPH



UPLFLN60XOIPH



UPLFLN100XO2PH



Unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Weight (g)	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	OFN
UPLFLN4XPH	0.13	17	81	—	—	—	U/BG	26.5
UPLFLN10X2PH	0.30	10	87	—	—	—	U/BG	26.5
UPLFLN20XPH	0.50	2.1	120	0.17	—	—	U/BG	26.5
UPLFLN40XPH	0.75	0.51	120	0.17	—	Yes	U/BG	26.5
UPLFLN60XOIPH	1.25–0.65	0.12	158	0.17	Oil	Yes	U/BG	26.5
UPLFLN100XO2PH	1.30	0.2	134	0.17	Oil	Yes	U/BG	26.5

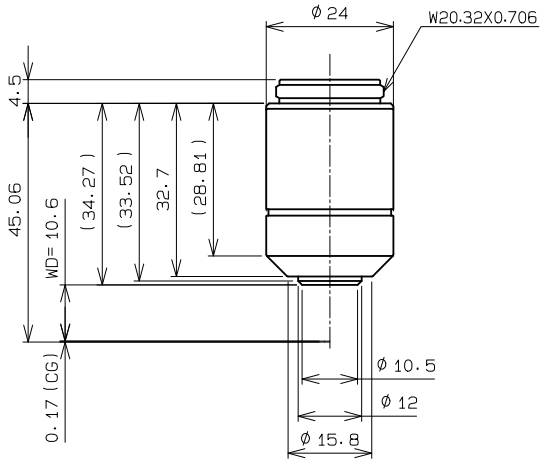
*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV excitation, BG: visible excitation. "( )" indicates that fluorescence might be slightly darker.

Plan Achromat for Phase Contrast

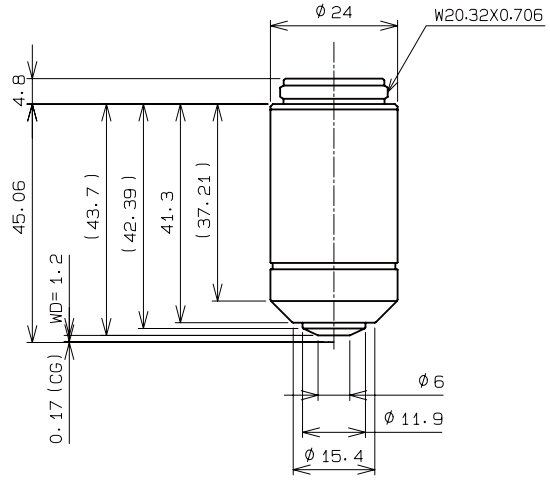
PLN-PH series

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

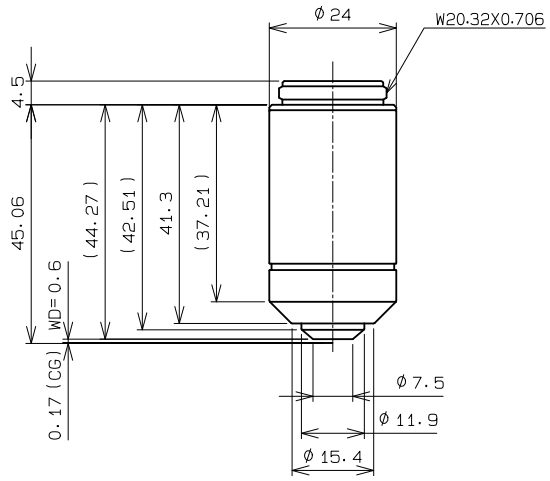
PLN10XPH



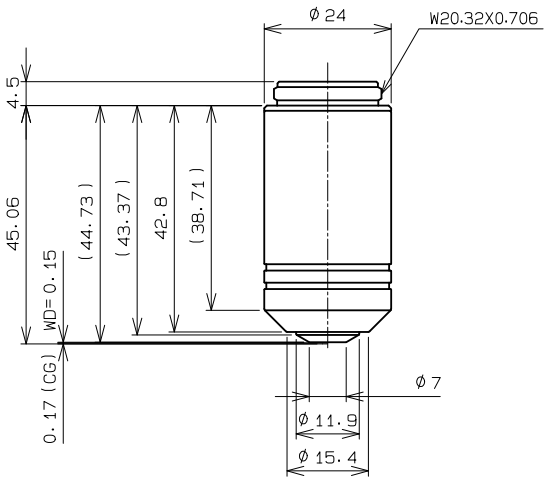
PLN20XPH



PLN40XPH



PLN100XOPH



Unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Weight (g	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	OFN
PLN10XPH	0.25	10.6	80	—	—	—	(BG)	22.0
PLN20XPH	0.40	1.2	113	0.17	—	Yes	(BG)	22.0
PLN40XPH	0.65	0.6	113	0.17	—	Yes	(BG)	22.0
PLN100XOPH	1.25	0.15	114	—	Oil	Yes	(BG)	22.0

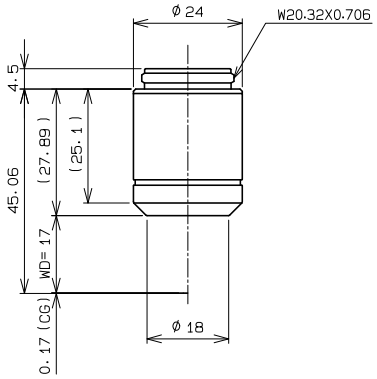
*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV excitation, BG: visible excitation. "( )" indicates that fluorescence might be slightly darker.

Universal Plan Semi Apochromat for Polarization

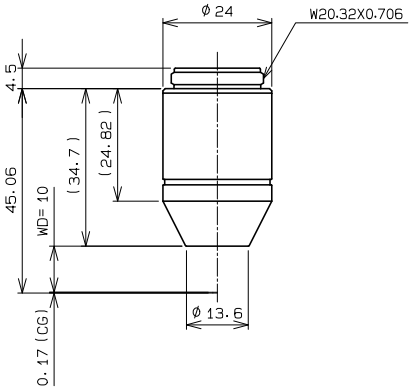
UPLFLN-P series

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 polarization, Nomarski DIC, brightfield, and fluorescence microscopy.

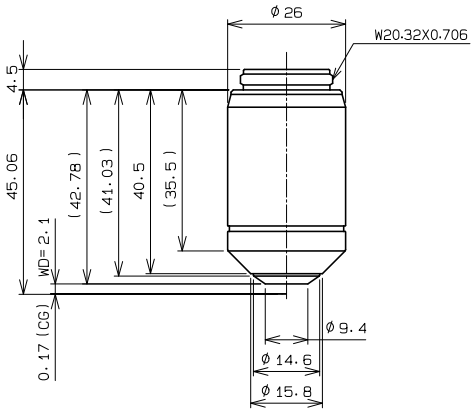
UPLFLN4XP



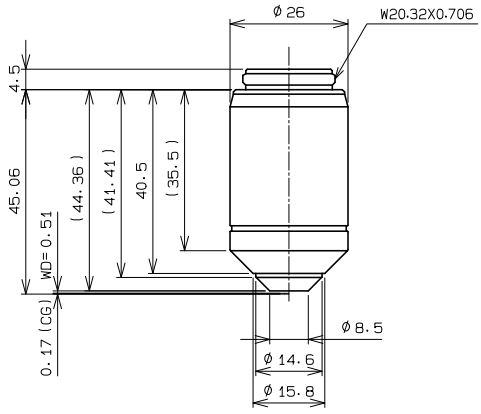
UPLFLN10XP



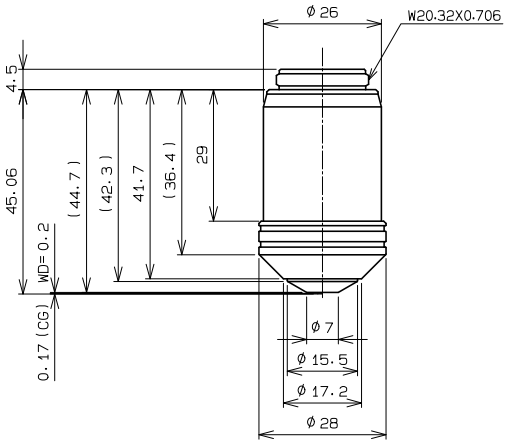
UPLFLN20XP



UPLFLN40XP



UPLFLN100XOP



Unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Weight (g)	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	OFN
UPLFLN4XP	0.13	17	80	—	—	—	U/BG	26.5
UPLFLN10XP	0.30	10	83	—	—	—	U/BG	26.5
UPLFLN20XP	0.50	2.1	122	0.17	—	—	U/BG	26.5
UPLFLN40XP	0.75	0.51	119	0.17	—	Yes	U/BG	26.5
UPLFLN100XOP	1.30	0.2	134	0.17	Oil	Yes	U/BG	26.5

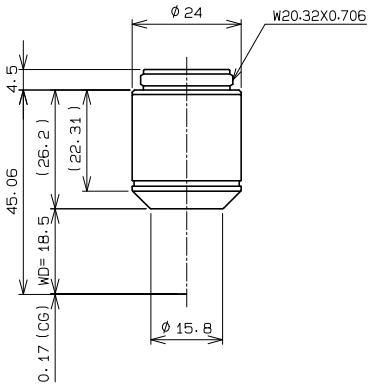
*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV excitation, BG: visible excitation. "( )" indicates that fluorescence might be slightly darker.

Achromat for Polarization

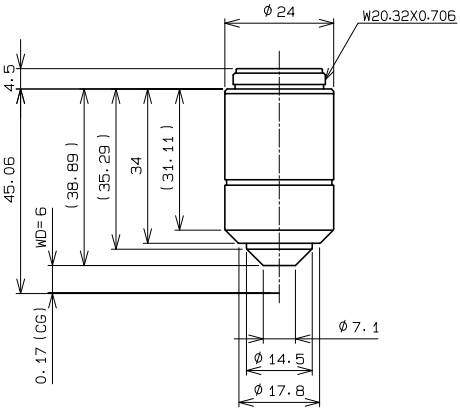
PLN-P, ACHN-P series

The PLN-P and ACHN-P achromat objectives enable transmitted polarized light observation at an affordable cost.

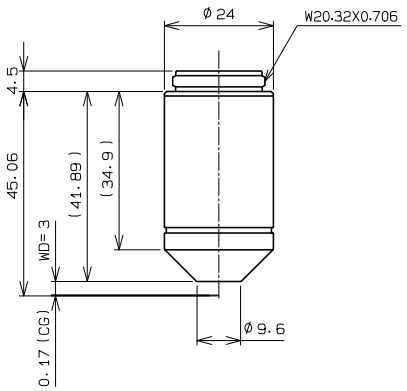
PLN4XP



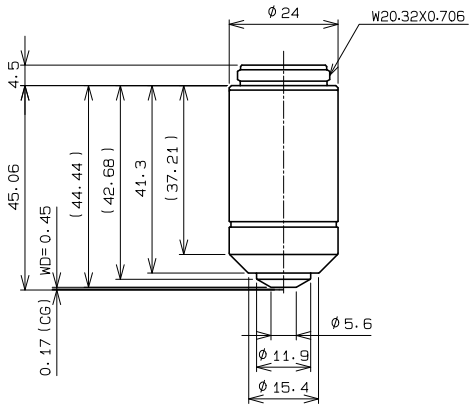
ACHN10XP



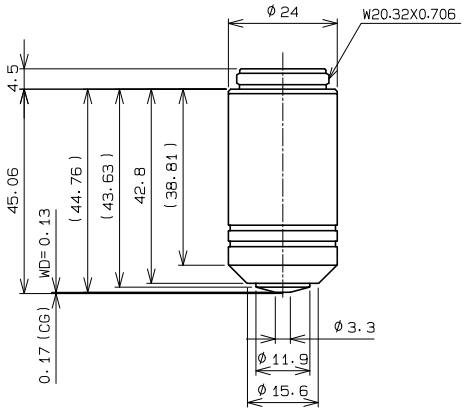
ACHN20XP



ACHN40XP



ACHN100XOP



Unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Weight (g)	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	OFN
PLN4XP	0.10	18.5	78	—	—	—	(BG)	22.0
ACHN10XP	0.25	6	88	—	—	—	(BG)	22.0
ACHN20XP	0.40	3	92	0.17	—	—	(BG)	22.0
ACHN40XP	0.65	0.45	100	0.17	—	Yes	(BG)	22.0
ACHN100XOP	1.25	0.13	116	—	Oil	Yes	(BG)	22.0

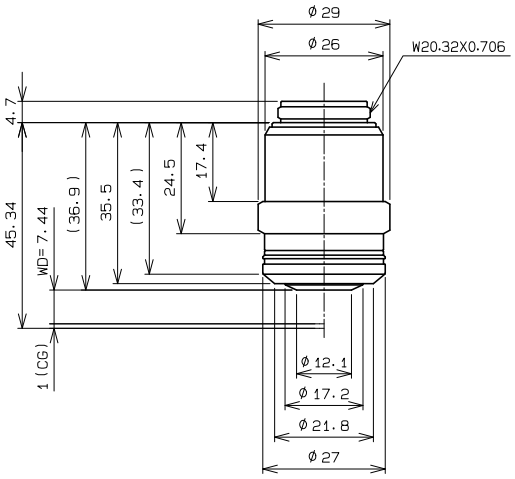
*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV excitation, BG: visible excitation. "( )" indicates that fluorescence might be slightly darker.

Long Working Distance Universal Plan Semi Apochromat

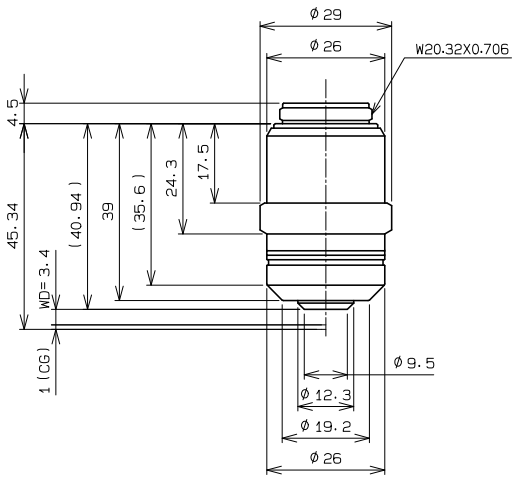
LUCPLFLN series

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 resolution in brightfield, DIC, and fluorescence observations.

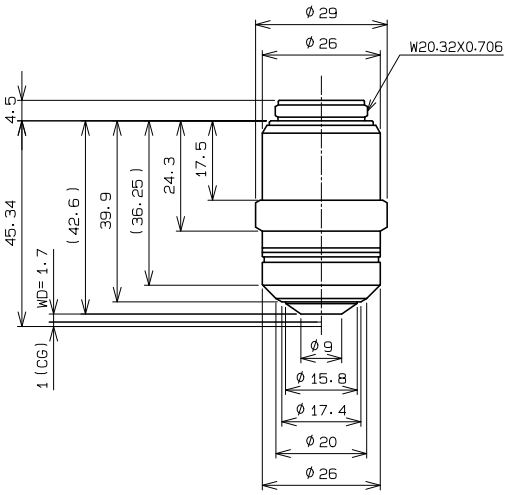
LUCPLFLN20X



LUCPLFLN40X



LUCPLFLN60X



Unit: mm

Objectives (Magnification)	NA	W.D. (mm) *	Weight (g)	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	OFN
LUCPLFLN20X	0.45	7.8–6.6	130	0–2	—	—	U/BG	22.0
LUCPLFLN40X	0.60	4–2.7	140	0–2	—	—	U/BG	22.0
LUCPLFLN60X	0.70	2.2–1.5	138	0.1–1.3	—	—	U/BG	22.0

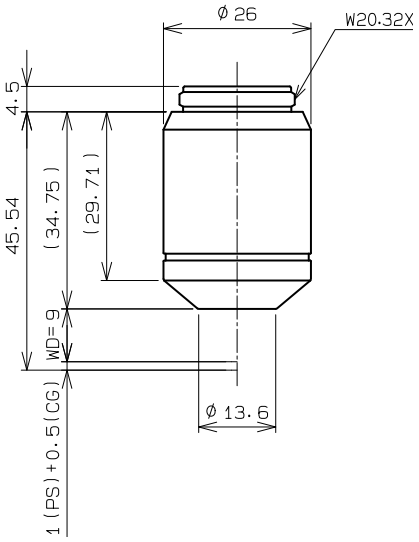
*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV excitation, BG: visible excitation. "( )" indicates that fluorescence might be slightly darker.

Long Working Distance Universal Plan Semi Apochromat for Relief Contrast

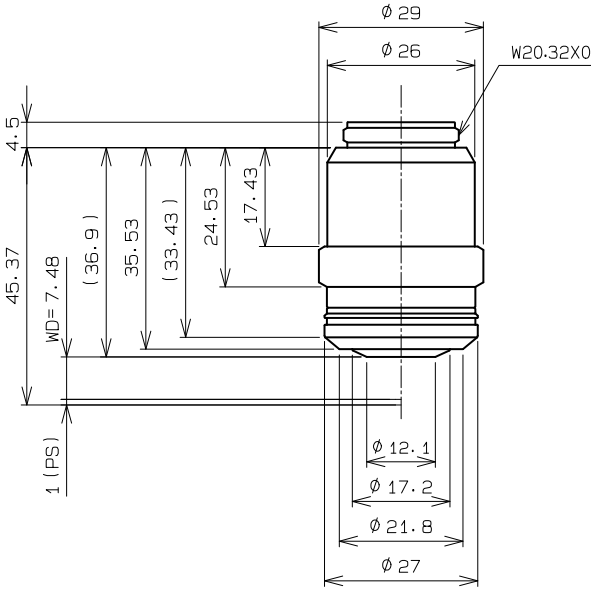
CPLFLN-RC, LUCPLFLN-RC series

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.

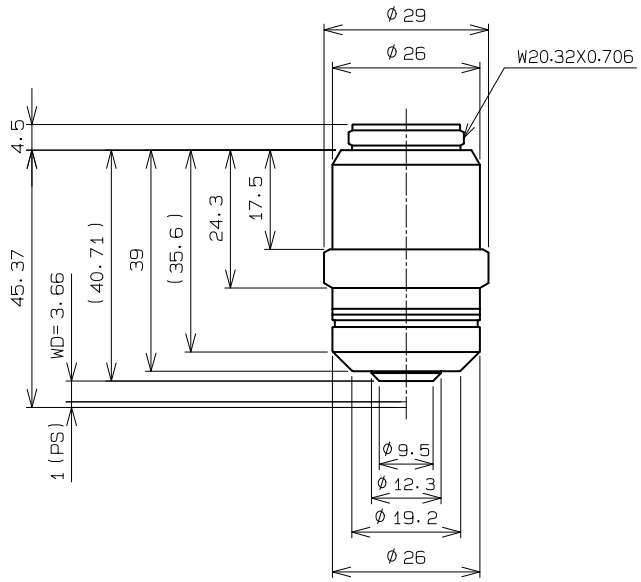
CPLFLN10XRC



LUCPLFLN20XRC



LUCPLFLN40XRC



Unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Weight (g)	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	OFN
CPLFLN10XRC	0.30	9 ***	108	0.15	—	—	BG	22.0
LUCPLFLN20XRC	0.45	7.8–6.6	128	0–2	—	—	U/BG	22.0
LUCPLFLN40XRC	0.60	4.2–3.0	138	0–2	—	—	U/BG	22.0

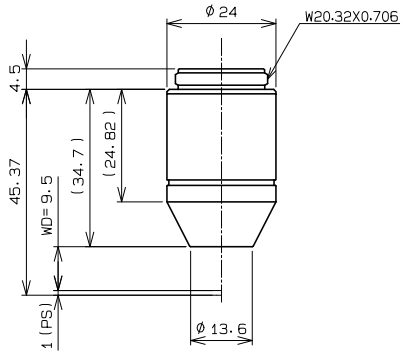
*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV excitation, BG: visible excitation. "( )" indicates that fluorescence might be slightly darker.
***Defined by 1 mm bottom thickness of a plastic container and 0.5 mm bottom thickness of a glass heat plate (depends on the shape of container).

Long Working Distance Universal Plan Semi Apochromat for Phase Contrast

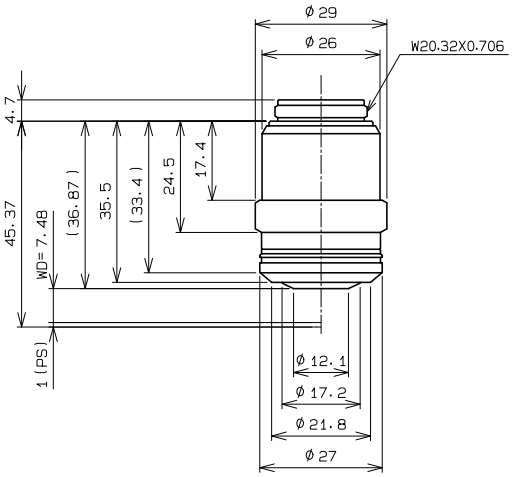
CPLFLN-PH, LUCPLFLN-PH series

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 phase contrast observation of cell cultures and help you achieve clear images regardless of the thickness and material of the vessel.

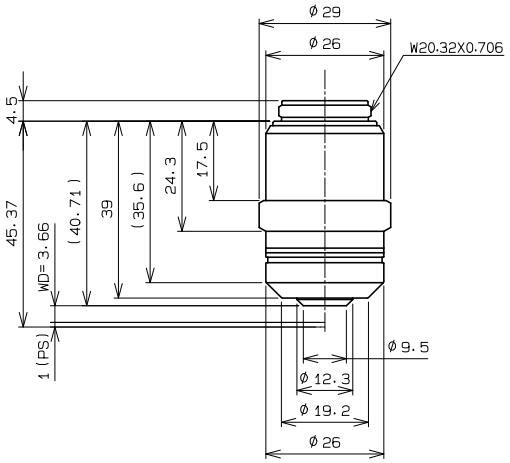
CPLFLN10XPH



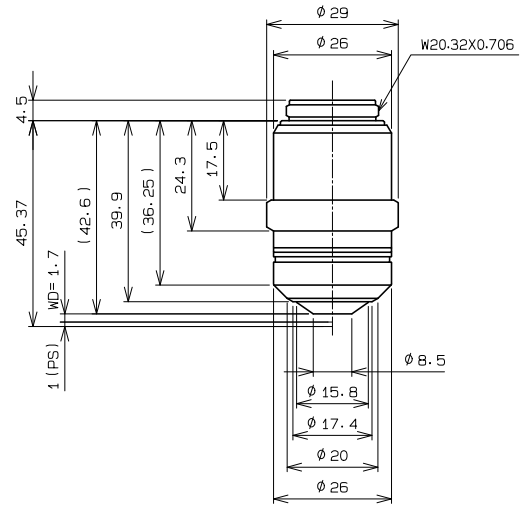
LUCPLFLN20XPH



LUCPLFLN40XPH



LUCPLFLN60XPH



Unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Weight (g)	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	OFN
CPLFLN10XPH	0.30	9.5 ***	87	1	—	—	BG	22.0
LUCPLFLN20XPH	0.45	7.8–6.6	132	0–2	—	—	U/BG	22.0
LUCPLFLN40XPH	0.60	4.2–3.0	140	0–2	—	—	U/BG	22.0
LUCPLFLN60XPH	0.70	2.2–1.5	138	0.1–1.3	—	—	U/BG	22.0

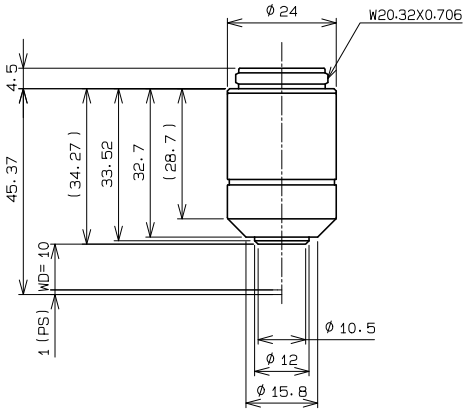
*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV excitation, BG: visible excitation. "( )" indicates that fluorescence might be slightly darker.
***Defined by 1 mm bottom thickness of a plastic container.

Culture Specimen Objectives for Phase Contrast

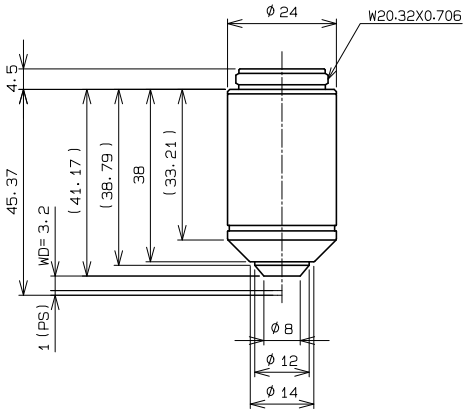
CPLN-PH, LCACHN-PH series

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

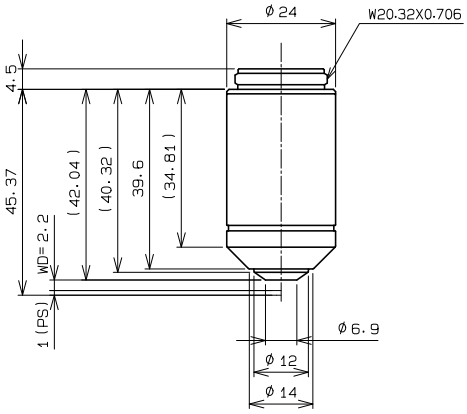
CPLN10XPH



LCACHN20XPH



LCACHN40XPH



Unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Weight (g)	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	OFN
CPLN10XPH	0.25	10 ***	80	0.1	—	—	—	22.0
LCACHN20XPH	0.40	3.2 ***	93	1	—	—	(BG)	22.0
LCACHN40XPH	0.55	2.2 ***	107	1	—	—	(BG)	22.0

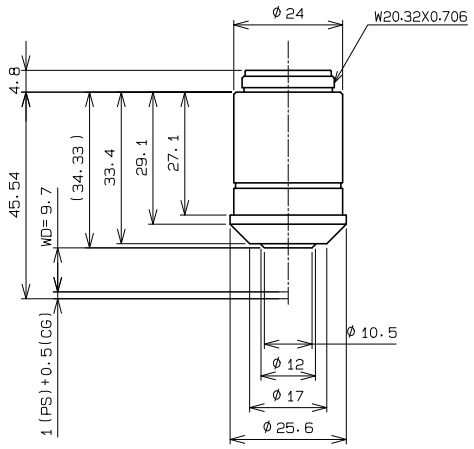
*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV excitation, BG: visible excitation. "( )" indicates that fluorescence might be slightly darker.
***Defined by 1 mm bottom thickness of a plastic container.

Culture Specimen Objectives for Relief Contrast

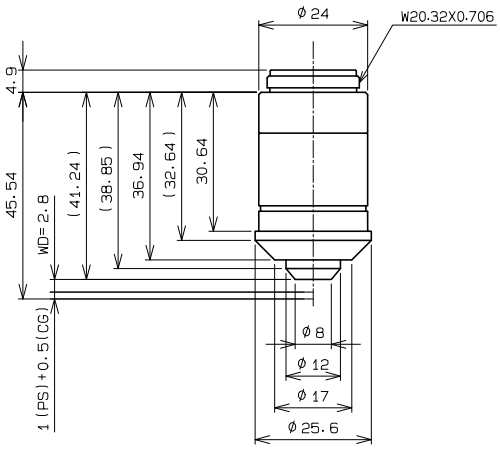
CPLN-RC, LCACHN-RC series

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.

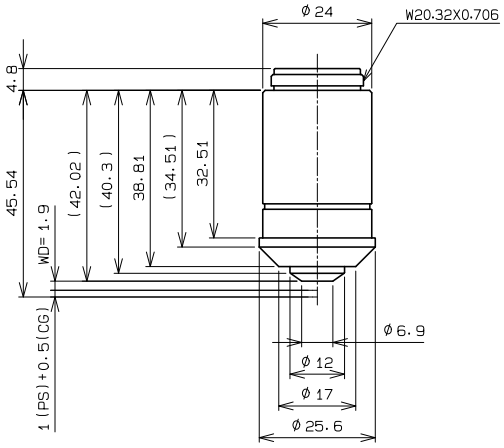
CPLN10XRC



LCACHN20XRC



LCACHN40XRC



Unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Weight (g)	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	OFN
CPLN10XRC	0.25	9.7 ***	98	0.15	—	—	—	22.0
LCACHN20XRC	0.40	2.8 ***	108	1.5	—	—	—	22.0
LCACHN40XRC	0.55	1.9 ***	112	1.5	—	—	—	22.0

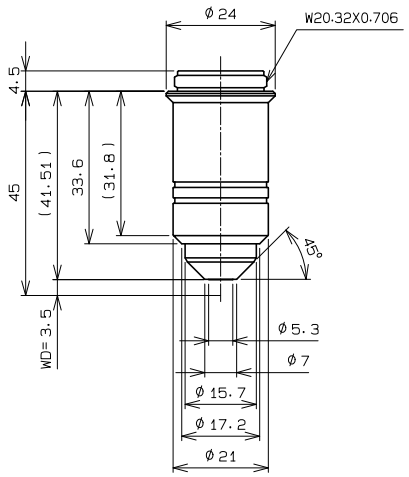
*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV excitation, BG: visible excitation. "( )" indicates that fluorescence might be slightly darker.
***Defined by 1 mm bottom thickness of a plastic container and 0.5 mm bottom thickness of a glass heat plate (depends on the shape of container).

No Cover Water Immersion for a Fixed Stage Upright Microscope

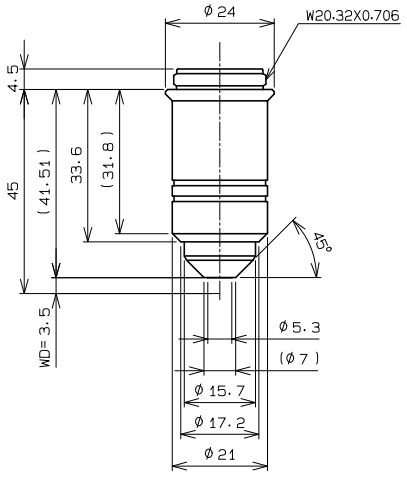
UMPLFLN-W, LUMPLFLN-W series

The UMPLFLN, LUMPLFLN-W, and LUMFLN semi-apochromat water immersion objectives have long working distances. They offer good image flatness and high transmission from the visible to the near-infrared region of the spectrum. These objectives are used for fluorescence imaging of brain tissue and measurements of the cell membrane electric potential using patch clamp electrodes.

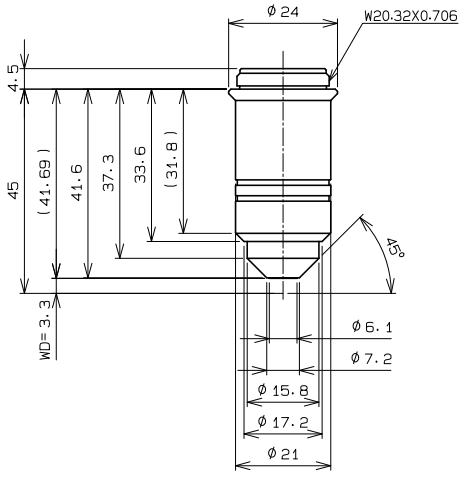
UMPLFLN10XW



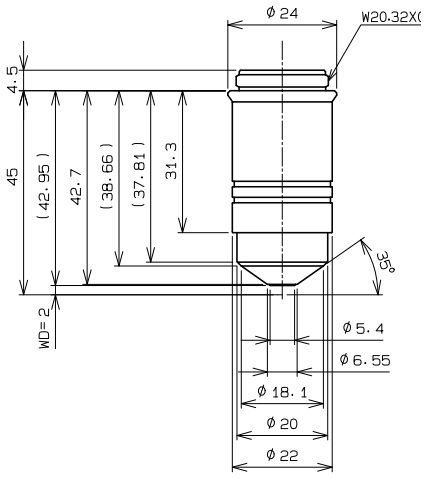
UMPLFLN20XW



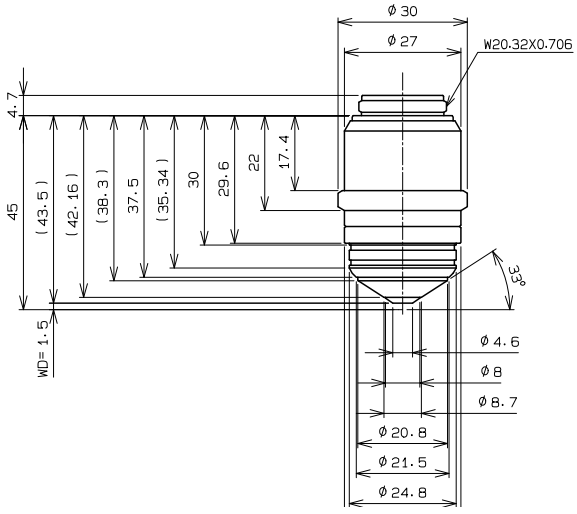
LUMPLFLN40XW



LUMPLFLN60XW



LUMFLN60XW



Unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Weight (g)	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	OFN
UMPLFLN10XW	0.30	3.50	66	0	Water	—	U/BG	26.5
UMPLFLN20XW	0.50	3.50	70	0	Water	—	U/BG	26.5
LUMPLFLN40XW	0.8	3	70	0	Water	—	U/BG	26.5
LUMPLFLN60XW	1.00	2	80	0	Water	—	U/BG	26.5
LUMFLN60XW	1.1	1.5	132	0	Water	—	U/BG	26.5

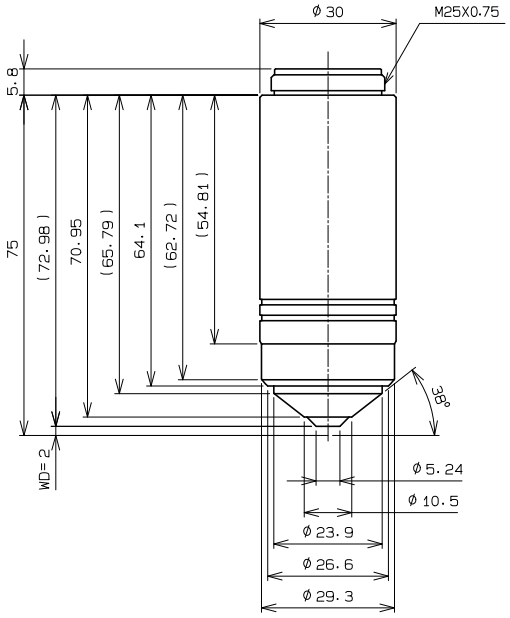
*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV excitation, BG: visible excitation. "( )" indicates that fluorescence might be slightly darker.

No Cover Water Immersion for a Fixed Stage Upright Microscope

XLUMPLFLN20XW

The XLUMPLFLN-W semi-apochromat water immersion objectives have a long working distance and a high numerical aperture. They offer good image flatness and high transmission from the visible to the near-infrared region of the spectrum. These objectives are used for fluorescence imaging of brain tissue and measurements of the cell membrane electric potential using patch clamp electrodes.

XLUMPLFLN20XW ***



Unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Weight (g)	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	OFN
XLUMPLFLN20XW ***	1.00	2	229	0	Water	—	U/BG	22.0

*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV excitation, BG: visible excitation. "( )" indicates that fluorescence might be slightly darker.
***Special dedicated nosepiece needed (WI-SNPXLU).

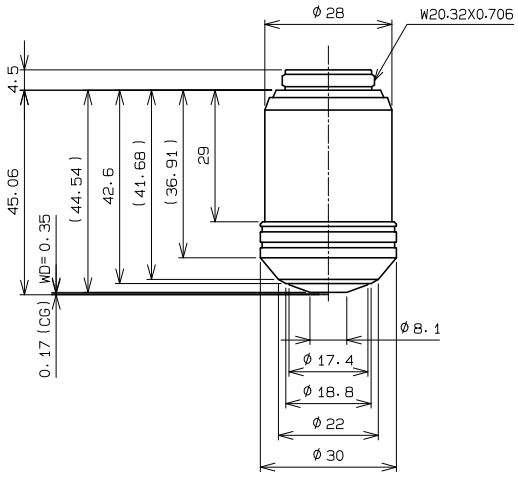
Microscope Objectives

Universal Apochromat

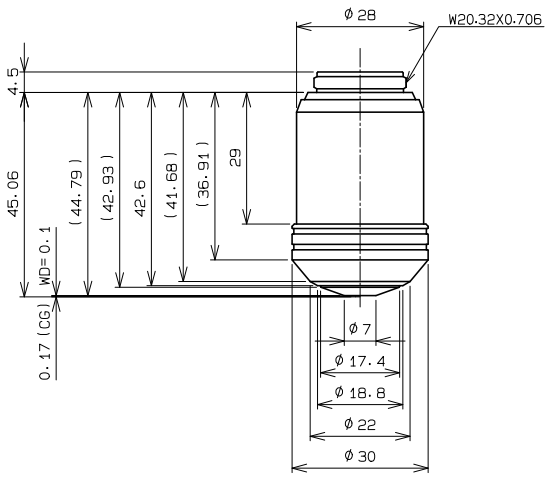
UAPON 340 series

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

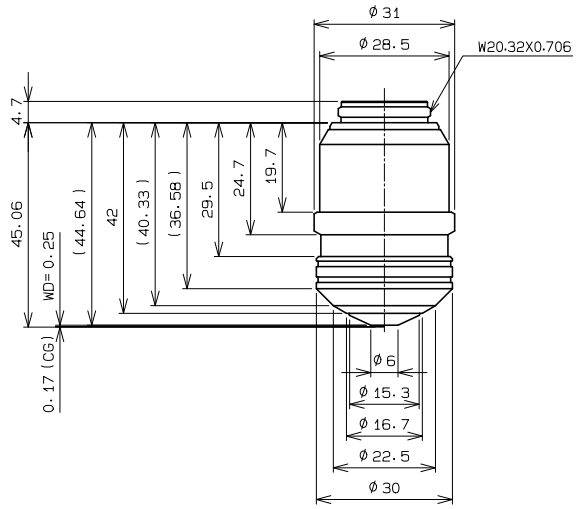
UAPON20XW340



UAPON40XO340-2



UAPON40XW340



Unit: mm

Objectives (magnification)	NA	W.D. (mm) *	Weight (g)	Cover Glass Thickness (mm)	Immersion	Spring	Fluorescence **	OFN
UAPON20XW340	0.70	0.35	182	0.17	Water	Yes	U/BG	22.0
UAPON40XO340-2	1.35	0.1	199	0.17	Oil	Yes	U/BG	22.0
UAPON40XW340	1.15	0.25	180	0.13-0.25	Water	Yes	U/BG	22.0

*Defined with cover glass thickness shown as “CG” in the above drawings.
**U: UV excitation, BG: visible excitation. "( )" indicates that fluorescence might be slightly darker.

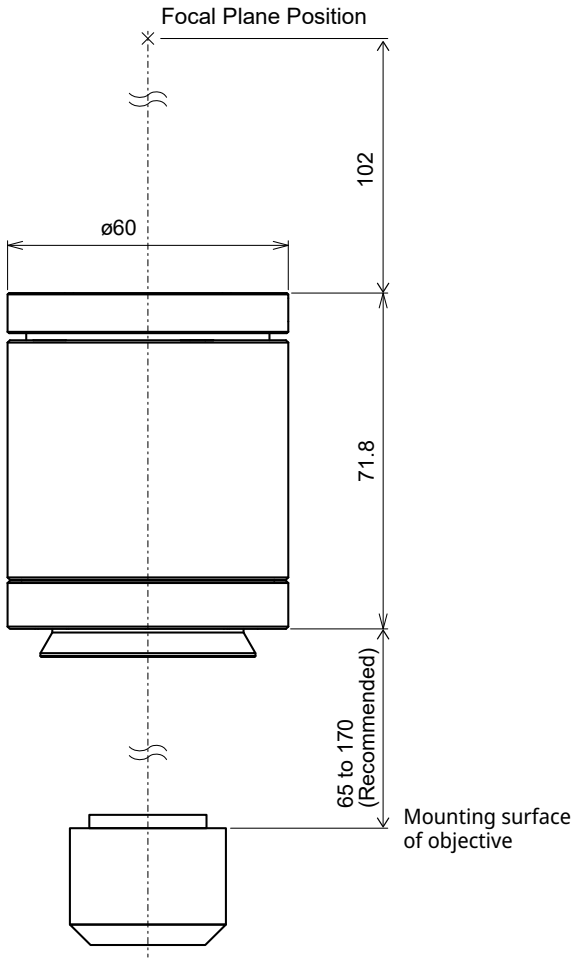
Tube Lens Unit

Universal Tube Lens

U-SWATLU, U-TLU, U-TLUIR

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

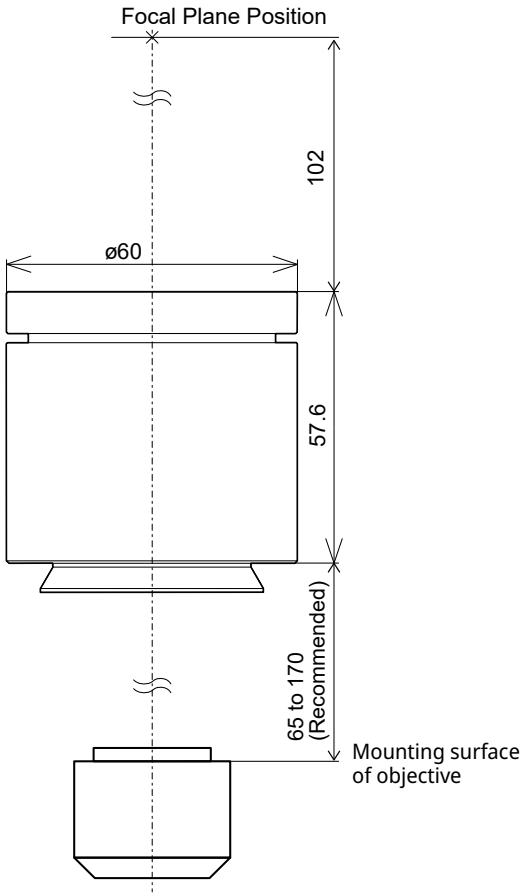
U-SWATLU
Super Wide Tube Lens Unit



Weight: 460 g

U-TLU
Single Port Tube with Lens

U-TLUIR
Single Port Tube with Lens for IR



Weight: 350 g

Unit: mm

Specifications

Model Name	U-SWATLU	U-TLU	U-TLUIR
Projection area (mm)	Ø26.5 mm	Ø22 mm	Ø22 mm
Mounting interface	Circular dovetail (fixed with a tool)*		
Focal plane position	102 mm from the reference place when using U-TV1XC		
Magnification	1X		
Focal length	f = 180 mm		

*Dovetail easily and directly fits Evident illuminators and Evident camera adaptors.

Tube Lens Unit

Tube Lens

SWTLU-C, TLU-C

Compact, lightweight SWTLU-C and TLU-C tube lenses are easy to integrate into your optical system. The SWTLU-C compact, super-wide tube lens and super-wide UIS2 objectives enable you to capture homogenous, flat images with minimal aberration across an up to 26.5 mm field of view.

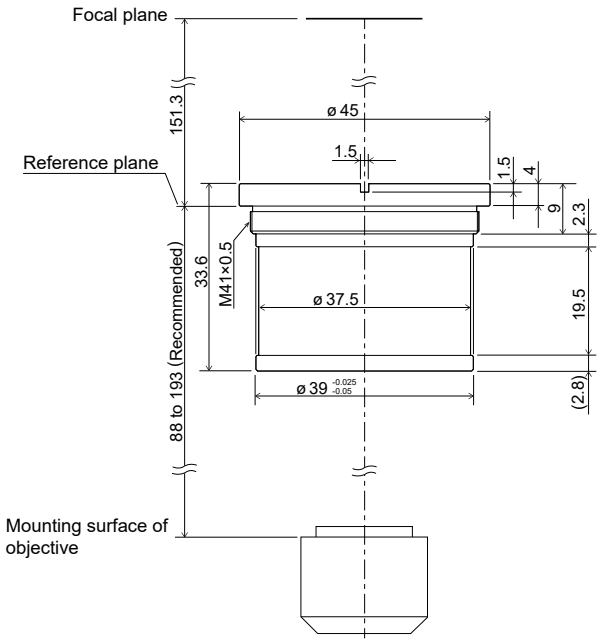
SWTLU-C

Tube Lens Unit for OEM Integration

Specifications

Product Name	SWTLU-C
Dimension	Ø 45 × 33.6 mm
Weight	94 g
Projection Area	26.5 mm *1)
Focal length	f= 180 mm
Magnification	1X *2)
Focal Plane Position	151.3 mm from the reference plane
Mounting Thread	M41 × 0.5 mm
Mounting Method	Screw In

*1) In combinations with OFN26.5 objectives
*2) In combination with UIS2 objectives (designed for f180 mm tube lens)



Unit: mm

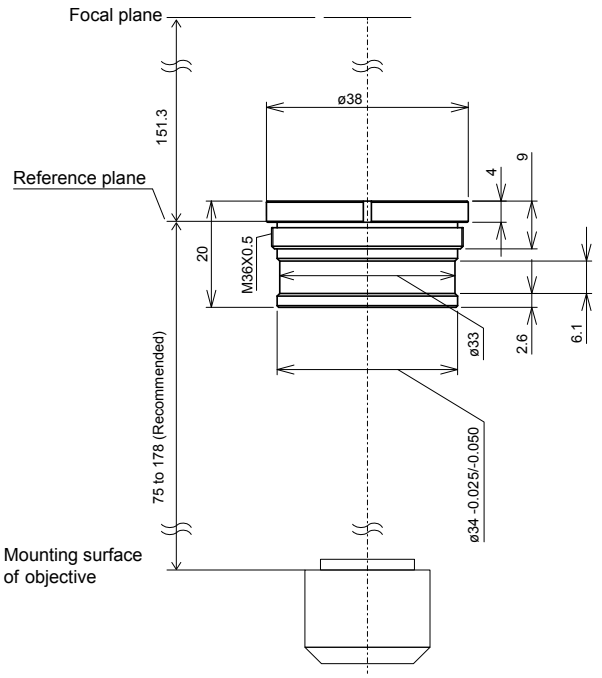
TLU-C

Tube Lens Unit for Component

Specifications

Product Name	TLU-C
Dimension	Ø 38 × 20 mm
Weight	40 g
Projection Area	22 mm
Focal Length	f= 180 mm
Magnification	1X *1)
Focal Plane Position	151.3 mm from the reference plane
Mounting Thread	M36 × 0.5 mm
Mounting Method	Screw In

*1) In combination with UIS2 objectives (designed for f180 mm tube lens)



Unit: mm

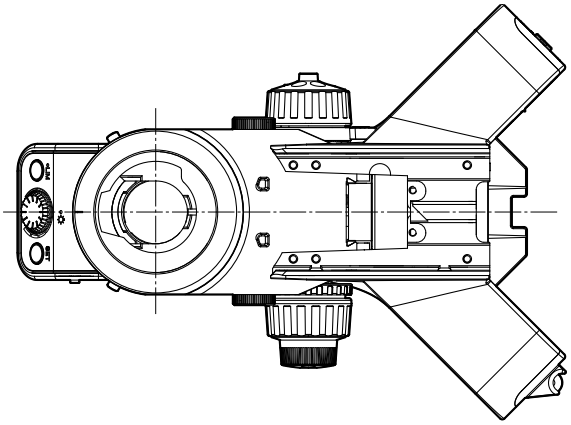
Microscope Frame

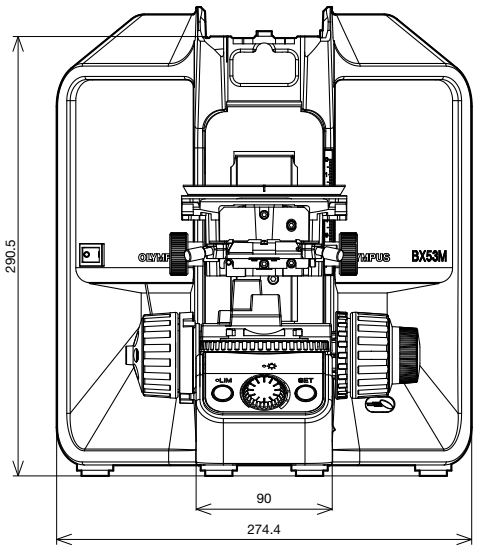
BX53M: Upright Transmitted and Reflected Light Microscope Frame

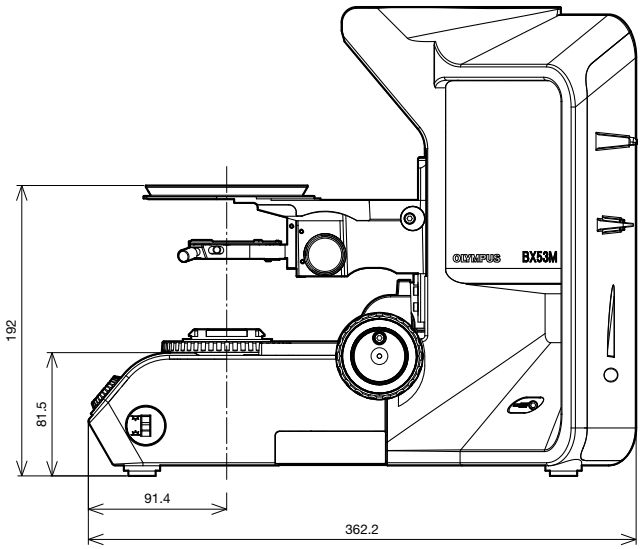
BX53MTRF-S

Designed with modularity in mind, the BX53M series provides 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

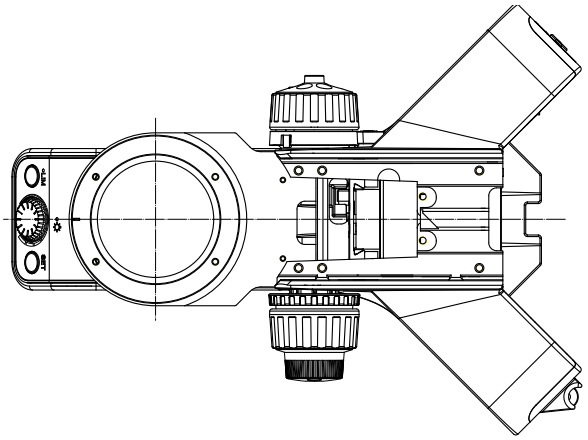
Microscope Frame

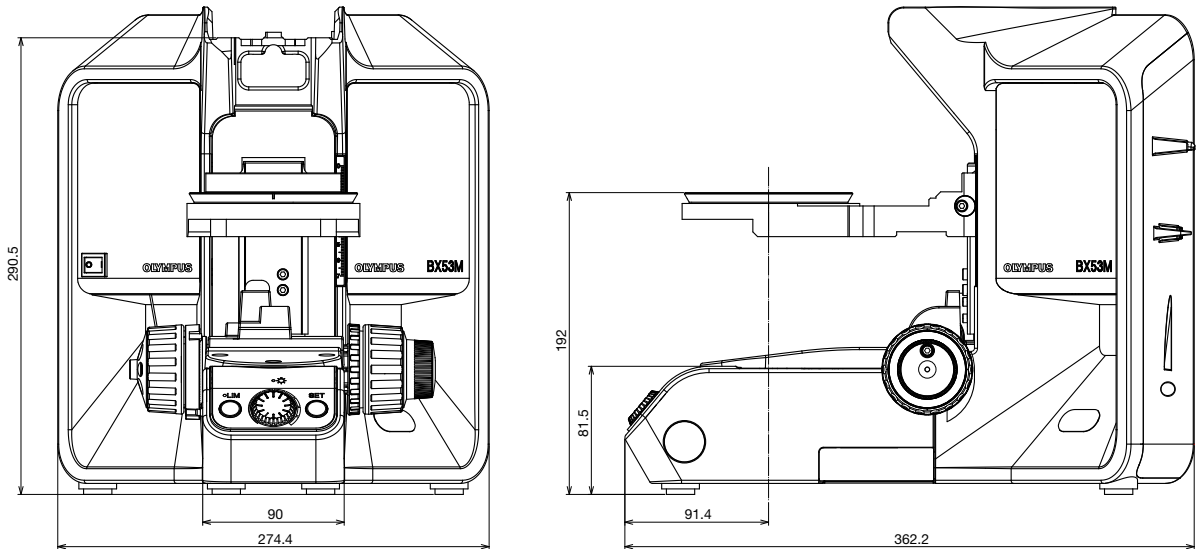
BX53M: Upright Reflected Light Microscope Frame

BX53MRF-S

Designed with modularity in mind, the BX3M series provides 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

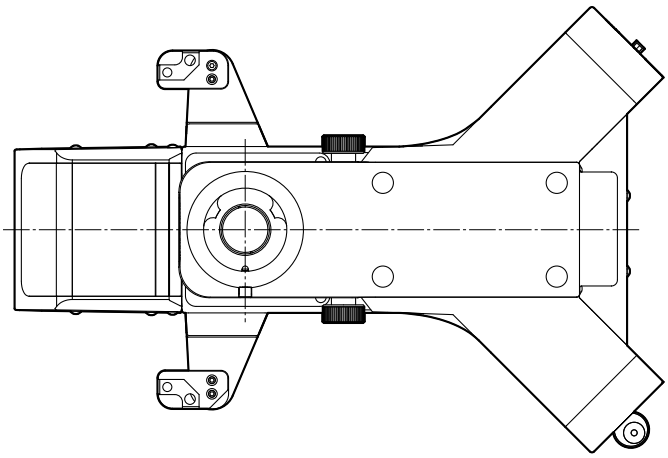
Microscope Frame

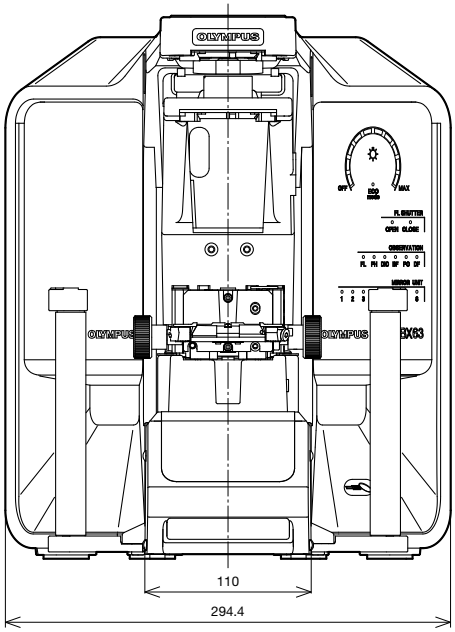
BX3: Automated Transmitted Light Microscope Frame

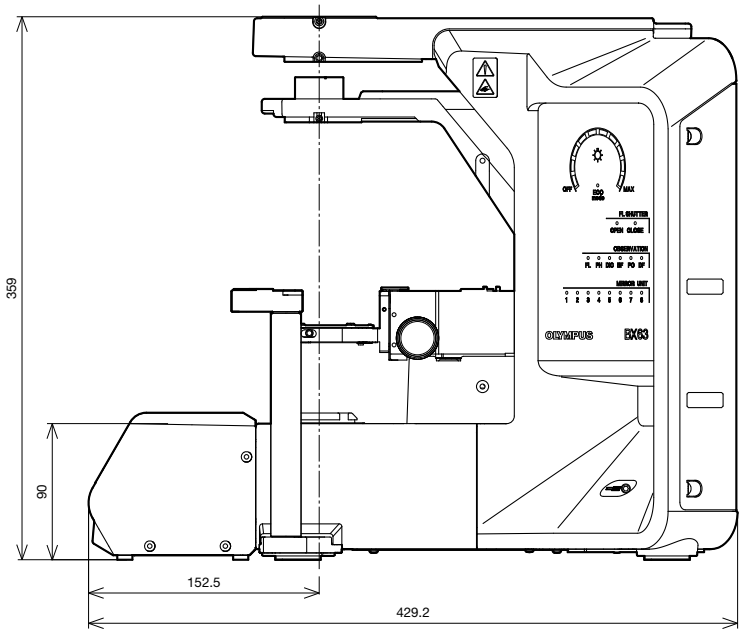
BX63F

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

BX63F







Weight: 14.1 kg Unit: mm

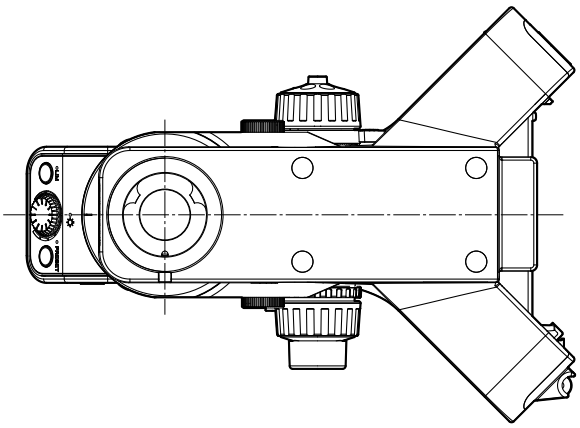
Microscope Frame

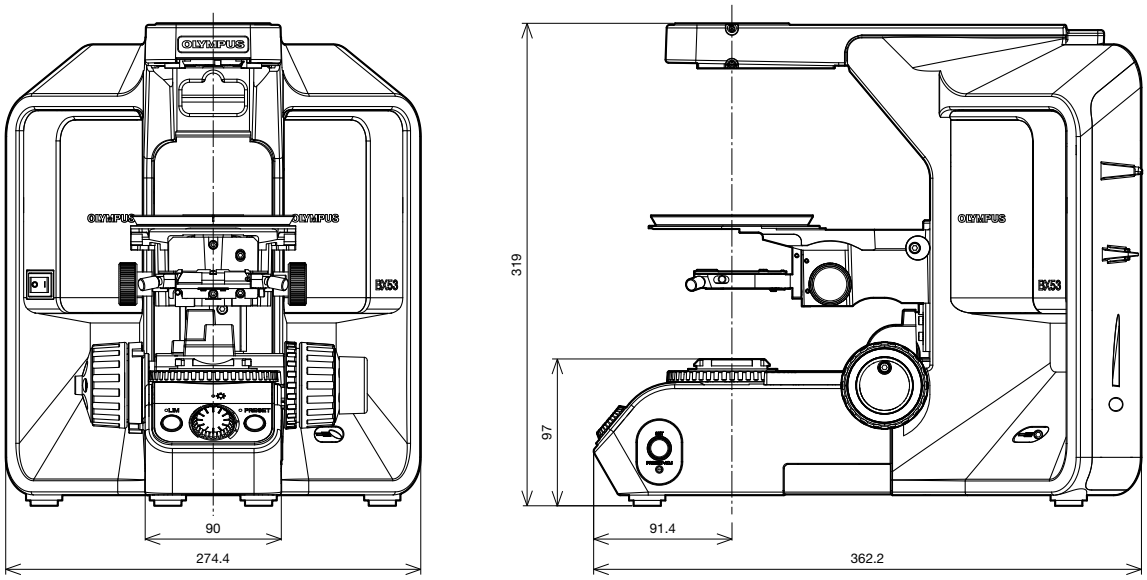
BX3: Semi-Motorized Fluorescence Transmitted Light Microscope Frame

BX53F2

The entire optical path of the BX53 microscope 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.

BX53F2 + BX3M-ARM





Weight: 9.7 kg Unit: mm

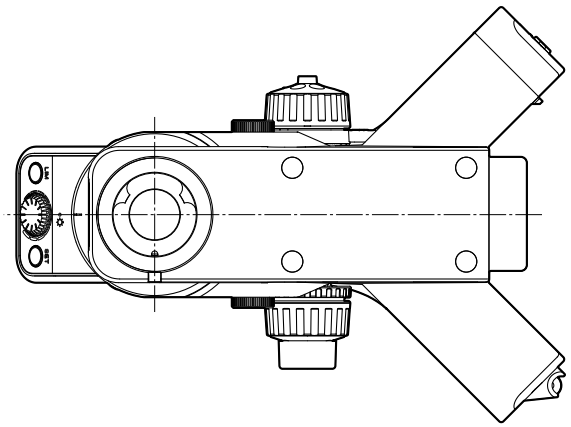
Microscope Frame

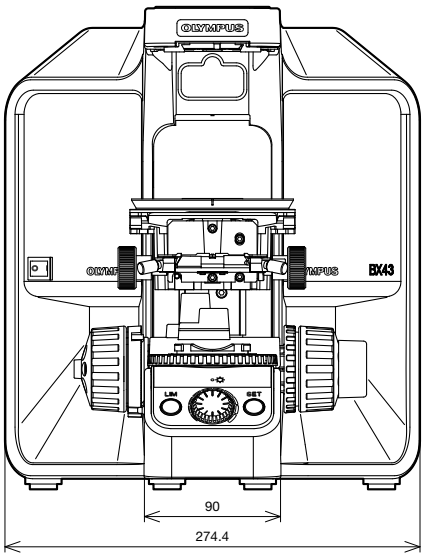
BX3: Manual System Transmitted Light Microscope Frame

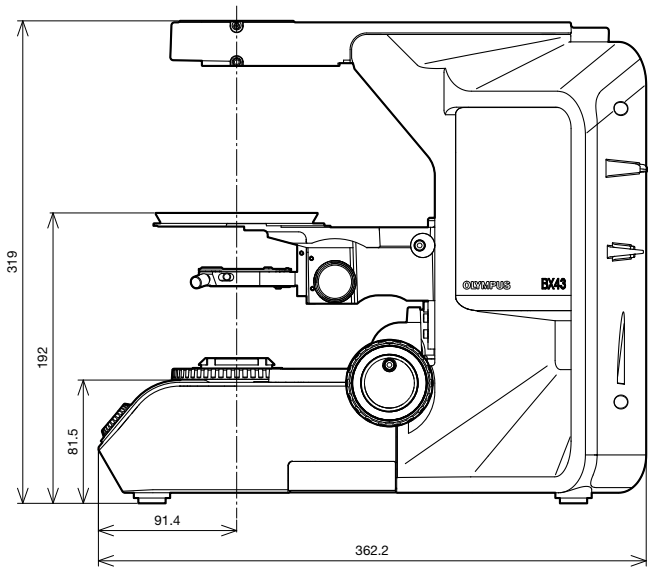
BX43F

The BX43 microscope offers a wide range of features, high 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

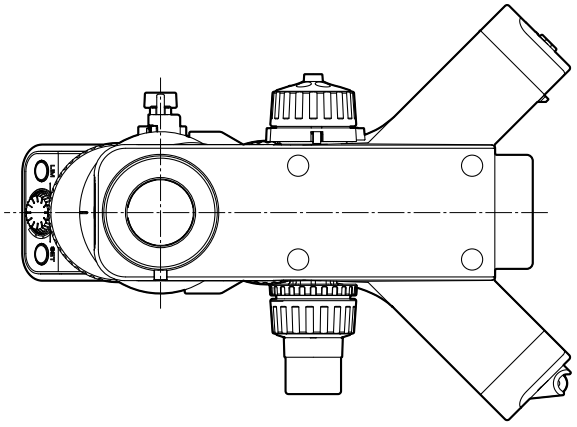
Microscope Frame

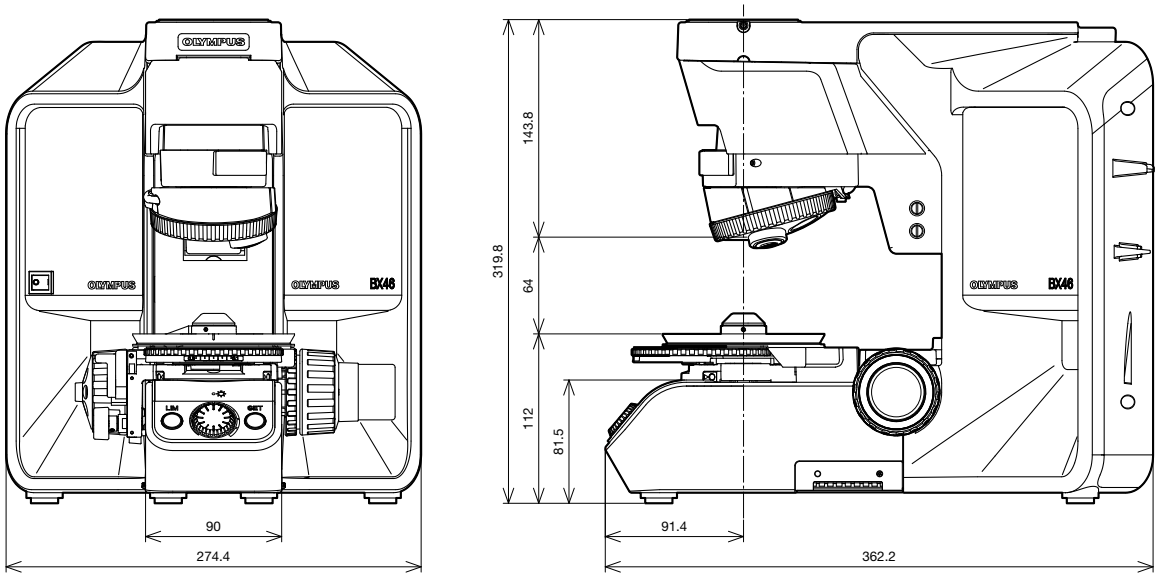
BX3: Transmitted Light Ergonomic Microscope Frame

BX46F

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

BX46F





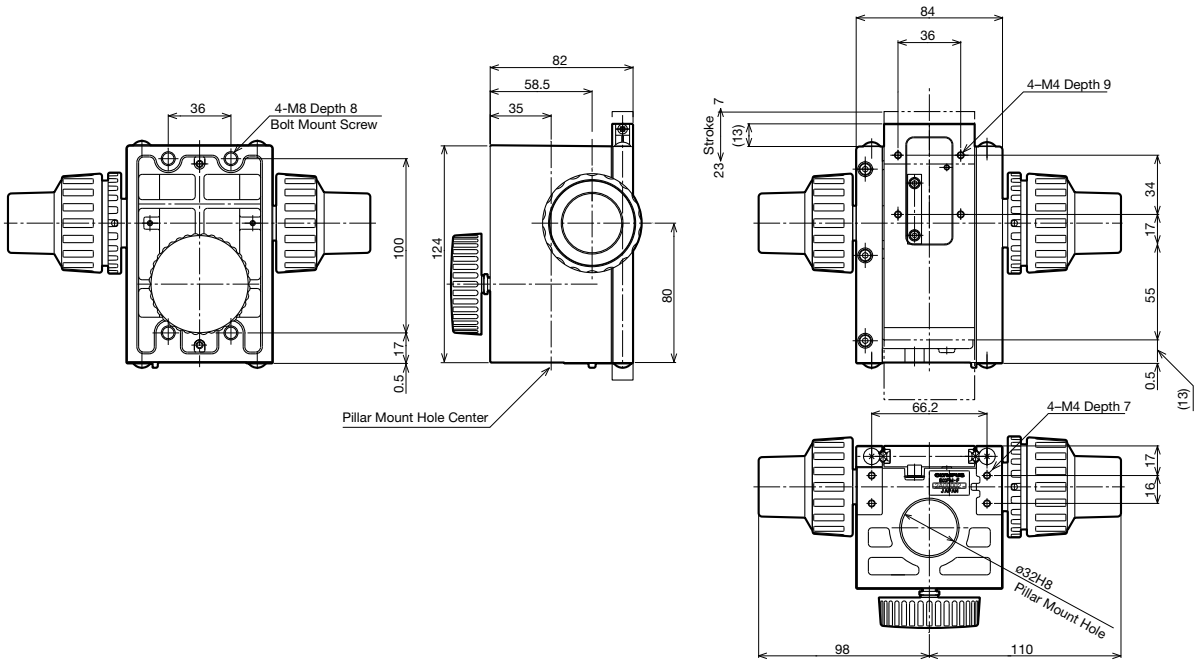
Weight: 9.8 kg Unit: mm

Microscope Frame

BXFM Frame

BXFM-F

This popular microscope frame can be used with LED illumination, a motorized nosepiece, and a tube lens unit. The frame can easily be integrated into other equipment, which can be attached by a rear bolt mounting screw or pillar mounting hole.



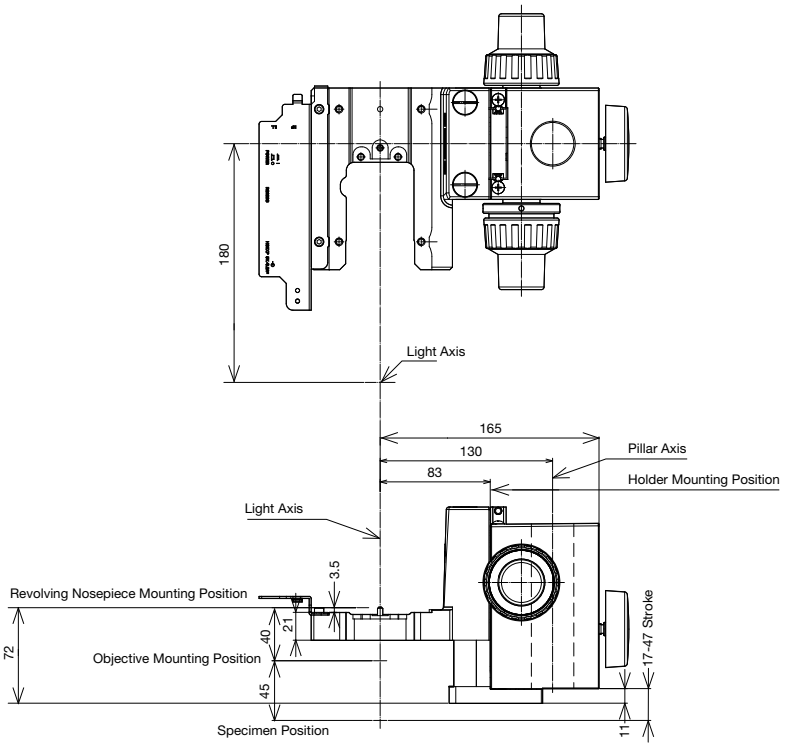
Weight: 1.9 kg Unit: mm

Microscope Frame

BXFM System Configuration Example 1

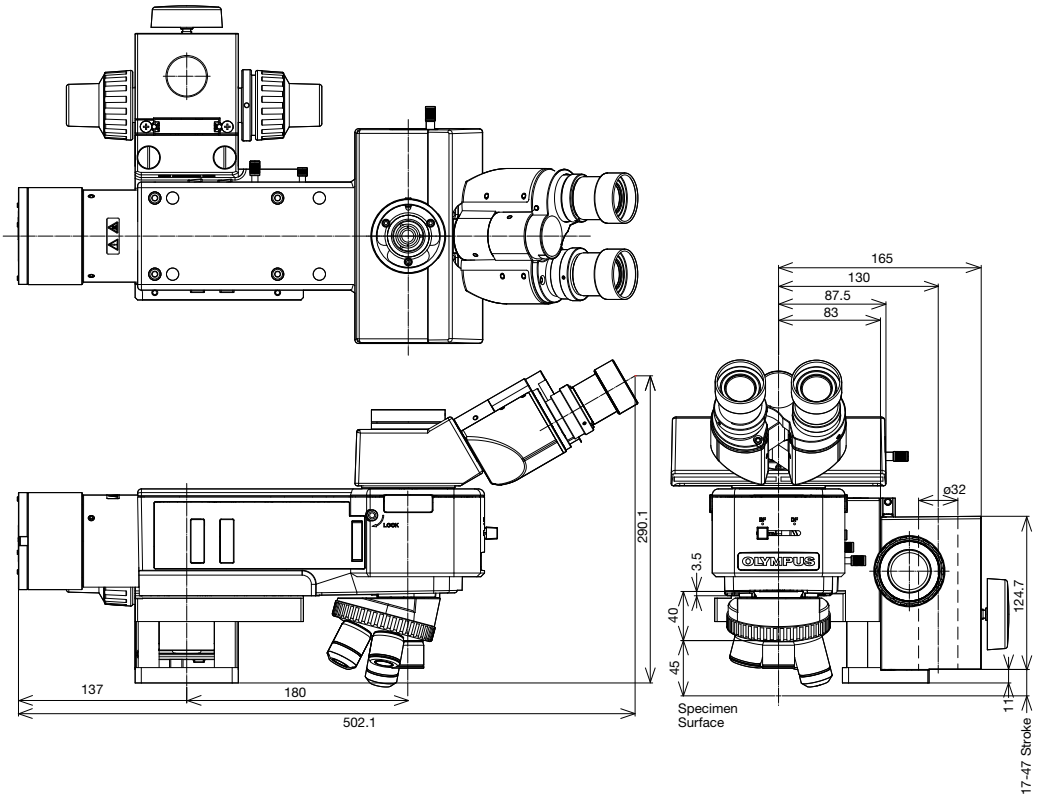
BXFM-F + BX3M-ILH + BXFM-ILHSPU

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



Weight: 3.2 kg Unit: mm

BXFM Combination Sample
BXFM-F + BX3M-ILH + BXFM-ILHSPU + U-TR30-2 + BX3M-RLA-S + BX3M-LEDR



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

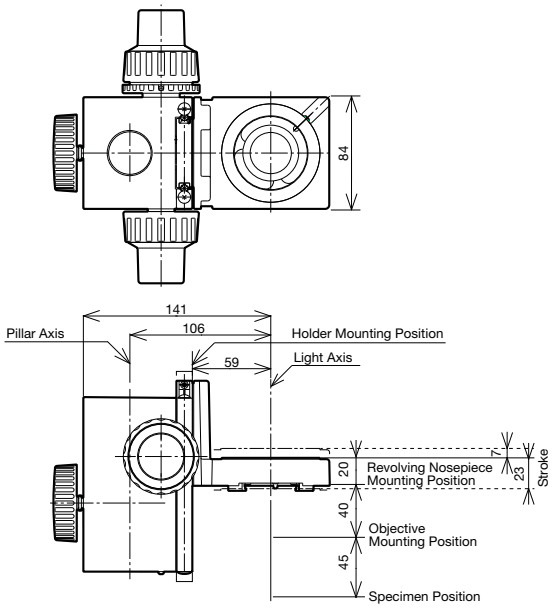
Weight: 8.2 kg (excludes objectives) Unit: mm

Microscope Frame

BXFM System Configuration Example 2

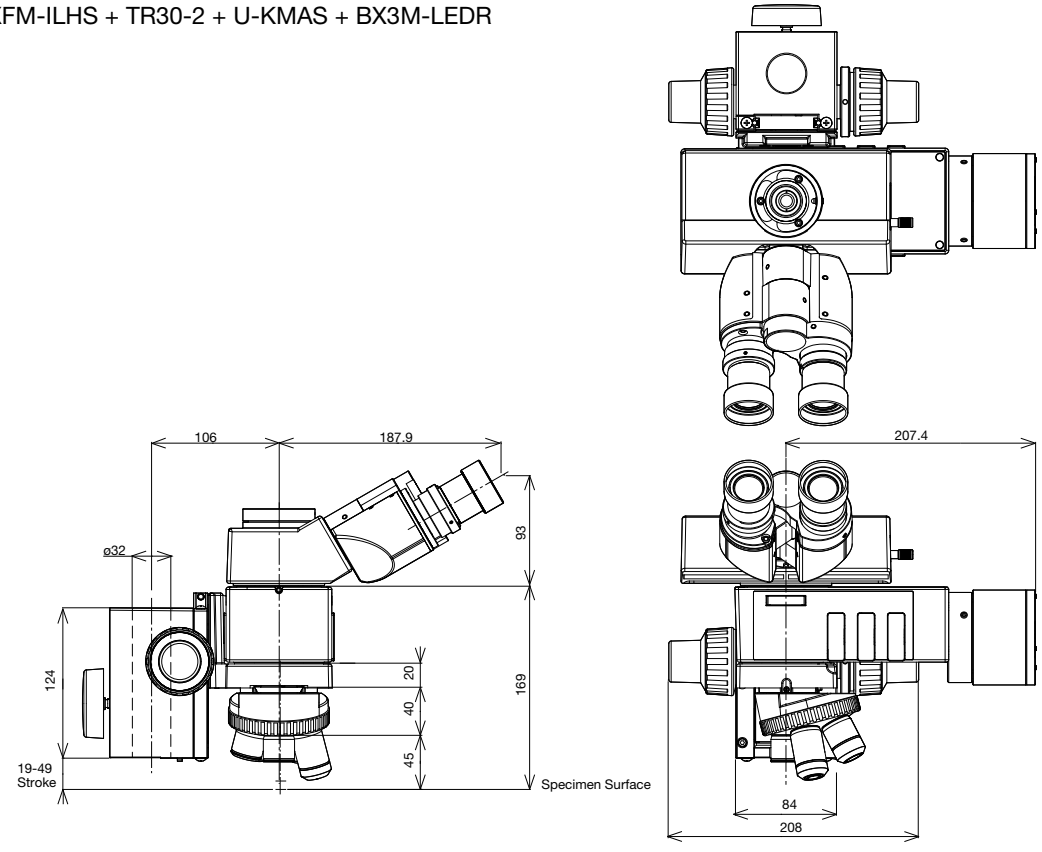
BXFM-F + BXFM-ILHS

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 + BX3M-LEDR



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

Weight: 5.5 kg (excludes objectives) Unit: mm

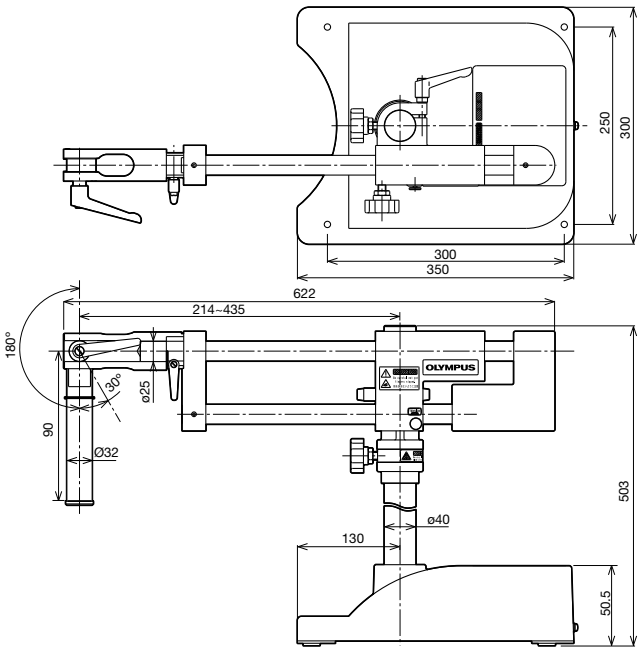
Microscope Frame

Stands for the BXFM system

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

SZ2-STU2

Universal Stand Type 2



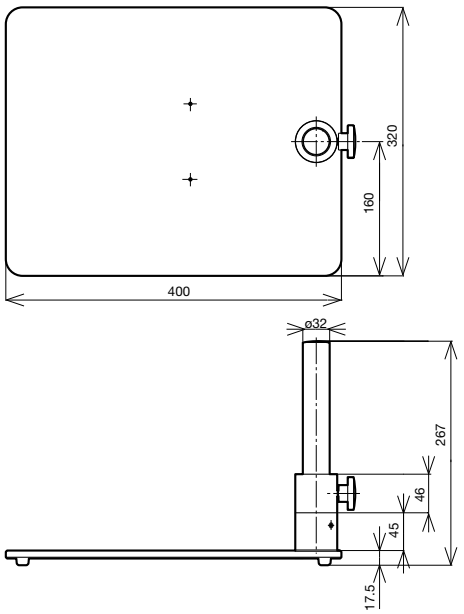
*The rotation angle of the horizontal arm can be restricted to 90 degrees with a stopper.

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

SZ-STL

Large Stand



Weight: 5 kg

Unit: mm

Illumination Units

Reflected Light Illuminators for the BX53M Microscope

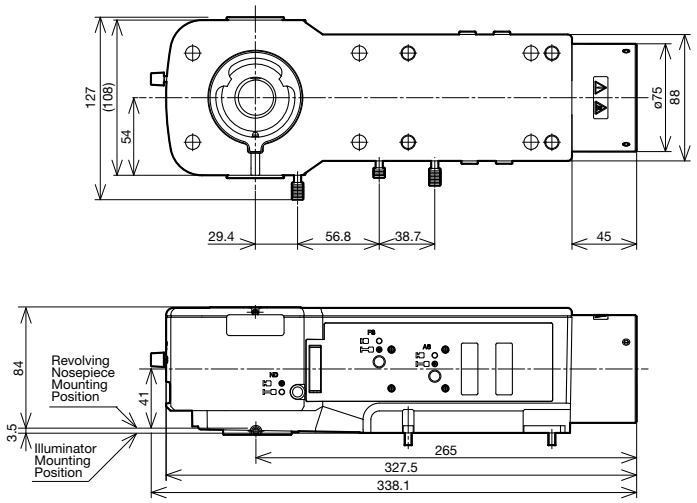
Manual illuminators for brightfield, darkfield, and fluorescence applications.

BX3M-RLA-S

Reflected Light Illuminator for BF/DF for the BX53M Microscope

Accessories

Unit Name	Description	Weight (g)
U-AN-2	Fixed Analyzer	50
U-AN360-3	Rotatable Analyzer	79
U-PO3	Fixed Polarizer	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



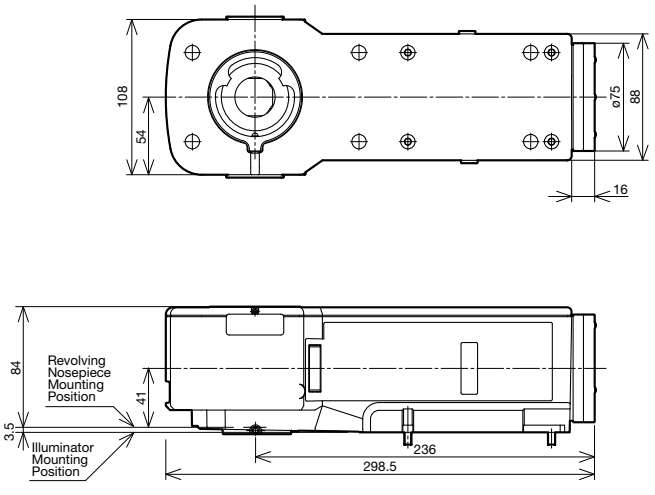
Weight: 3.0 kg

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-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

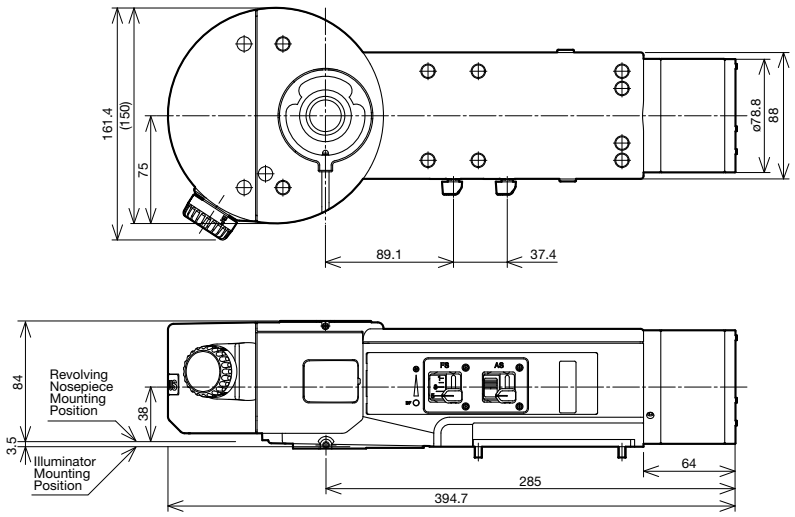
Coded illuminators require users to physically change the device's settings, but the microscope's software automatically recognizes these changes.

BX3M-RLAS-S

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

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



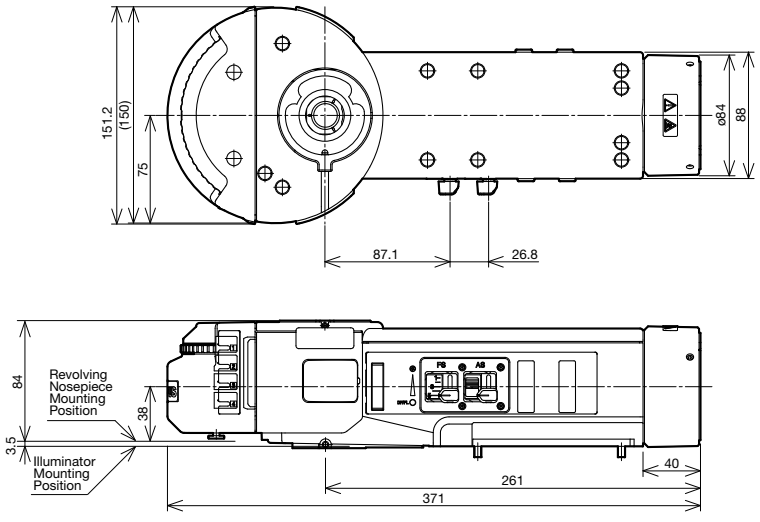
Weight: 3.6 kg

BX3M-URAS-S

Coded Universal Reflected Light Illuminator for the BX53M Frame

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: 3.2 kg

Unit: mm

Illumination Units

Reflected Illuminator for the BX3 Series

Manual illuminators for brightfield, darkfield, and fluorescence applications.

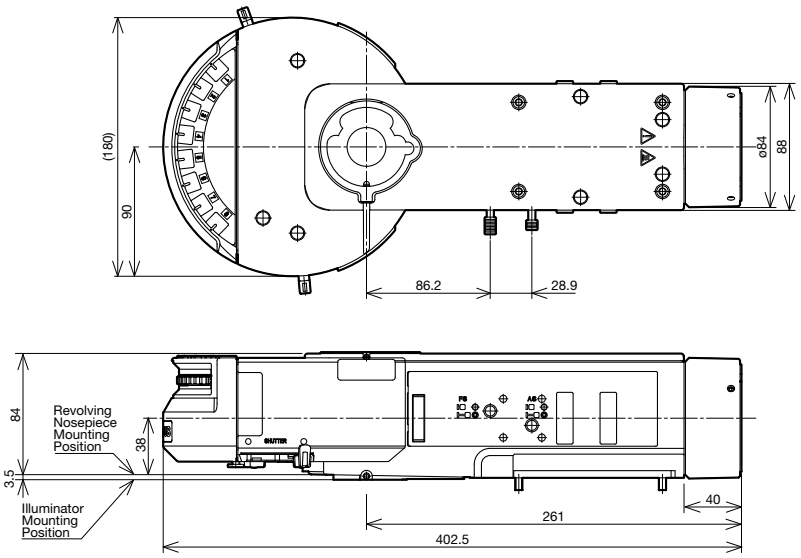
BX3-URA

Universal Reflected Illuminator for the BX3 Series

A total of eight fluorescence mirror units can be attached for multicolor 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-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

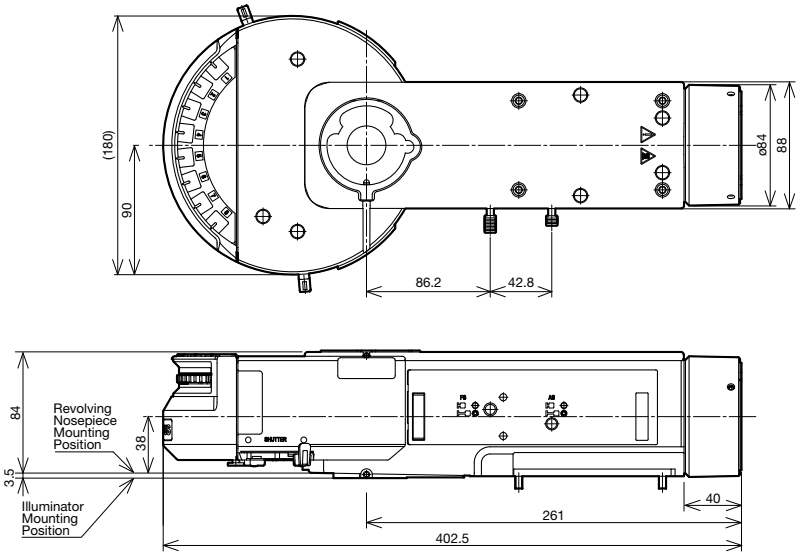
BX3-RFAS

Coded Fluorescence Illuminator for the BX3 Series

The eight fluorescence mirror units feature coded functionality.

Accessories

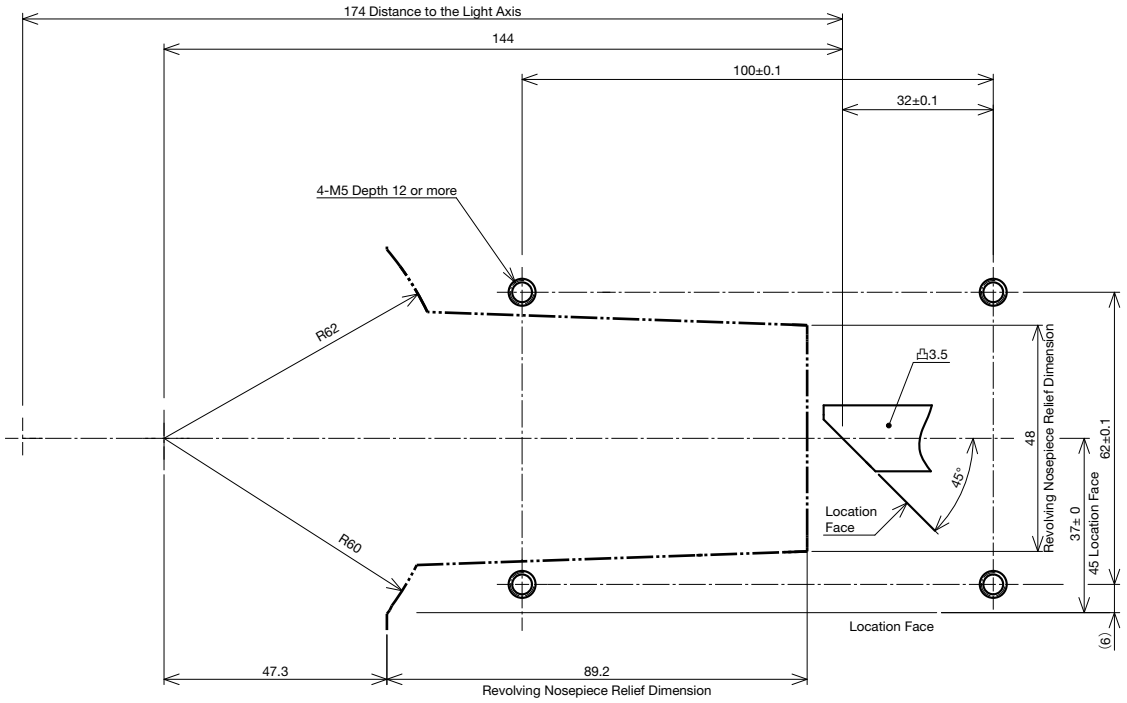
Unit Name	Description	Weight (g)
U-AN-2	Fixed analyzer	50
U-AN360-3	Rotatable analyzer	79
U-PO3	Fixed polarizer	71
U-25LBD	Daylight color filter	20
U-25LBA	Halogen color filter	20
U-25IF550	Green filter	20
U-25L42	UV-cut filter	20
U-25Y48	Yellow filter	20
U-25FR	Frost filter	20
U-25	Empty filter, for 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

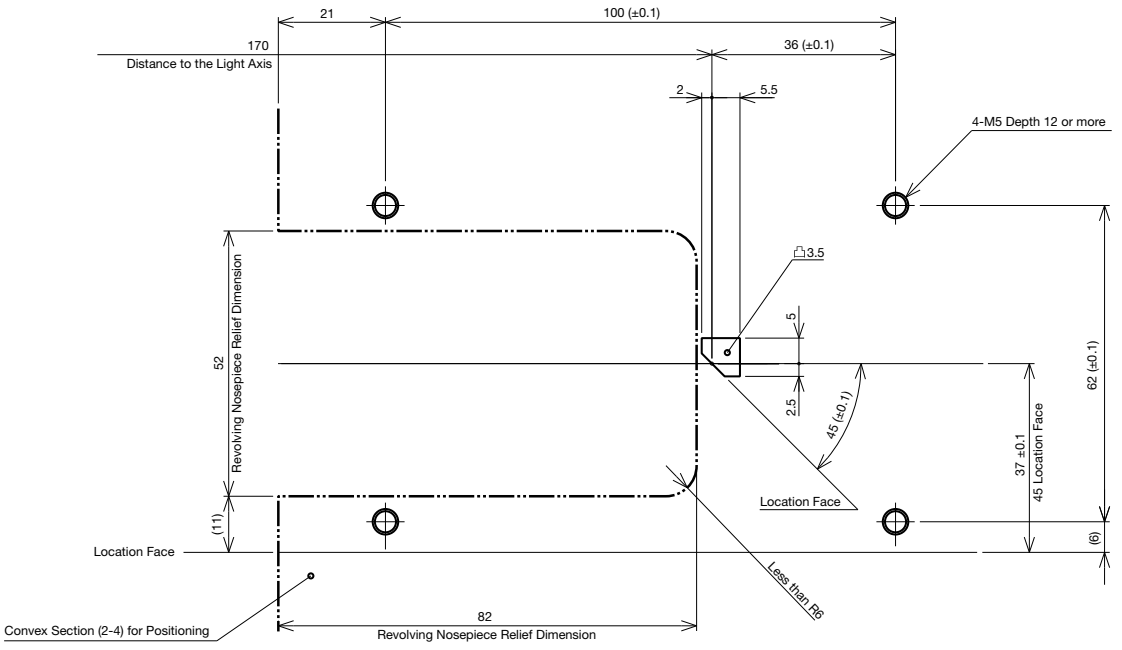
Mounting Dimensions of Illuminator (BX3M-RLA-S, BX3M-RLAS-S, BX3M-URAS-S, BX3M-KMA-S, BX3-RFAS, BX3-URA)



Fix illuminator using four M5 screws and projection for fastening.

Unit: mm

Mounting Dimensions of Illuminator (BXC-RLI, BXC-RLI-LGCA, BXC-RLI-CA)



Fix illuminator using four M5 screws and projection for fastening.

Unit: mm

Illumination Units

Compact Reflected Light Illuminator for BF

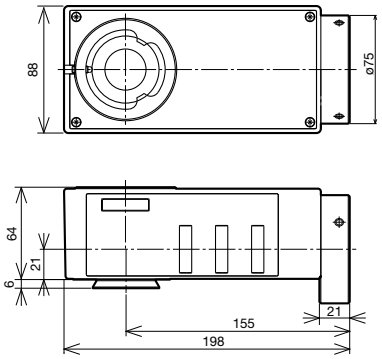
U-KMAS

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-AN360-3	Rotatable Analyzer	79
U-AN	Analyzer Slider for Reflected Light	50
U-DICR	DIC Slider for Reflected Light	130



Weight: 1.2 kg

Unit: mm

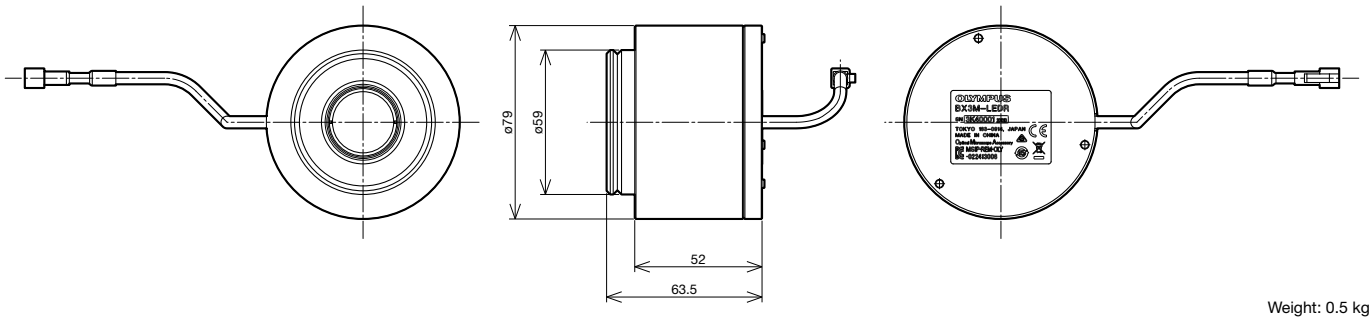
Light Source Units

LED Lamp Housing for the BX53M Microscope

The BX53M microscope uses a high-intensity white LED light source for both reflected and transmitted light. High-intensity light supports various observation modes such as brightfield, darkfield, differential interference contrast (DIC), and polarization.

BX3M-LEDR

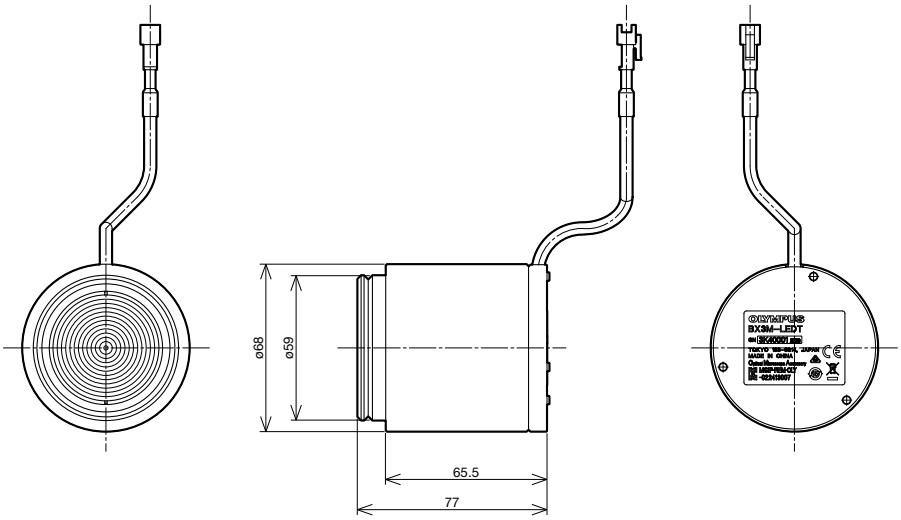
LED Lamp Housing for BX3M Reflected



Weight: 0.5 kg

BX3M-LEDT

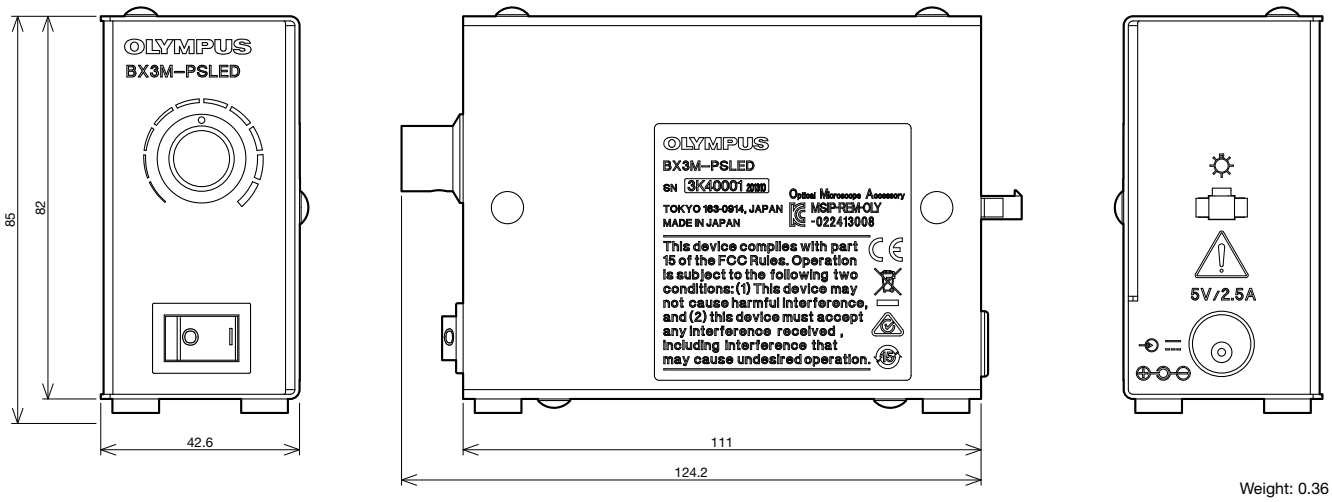
LED Lamp Housing for BX3M Transmitted



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

MIX Slider for Reflected Illumination

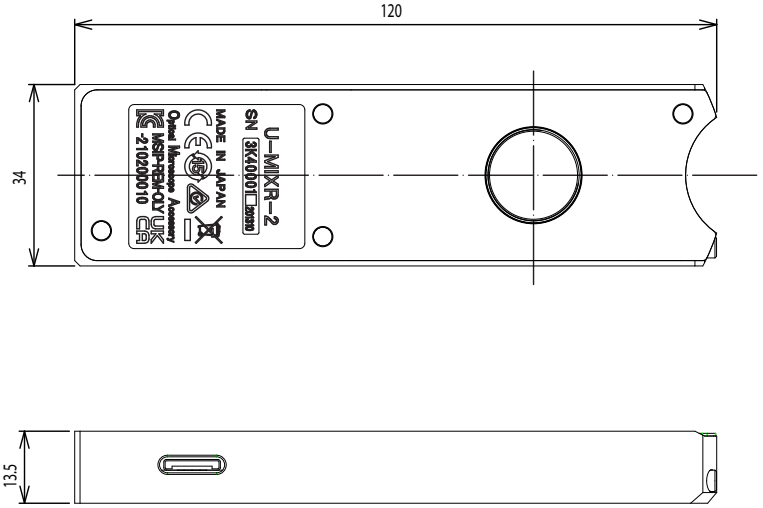
U-MIXR-2

The MIX slider enhances traditional darkfield with 16 individually controllable LEDs, enabling you to control the direction of light shining on the sample. Using MIX observation, directional darkfield can be combined with another observation method, such as brightfield, simple polarization, or fluorescence, to show more details in a sample at once. This capability is especially helpful to highlight defects and differentiate raised surfaces from depressions.

MIX Slider Specifications

U-MIXR-2

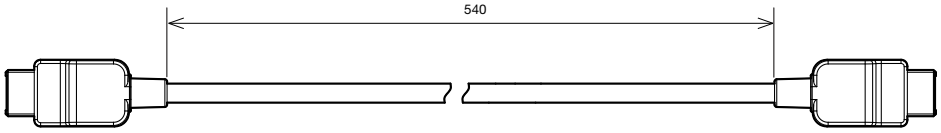
Illumination: LED
Light on/off indicates the cable is connected/ disconnected
Dimensions (W x H x D):
34 mm × 13.5 mm × 120 mm
Weight: 83 g



MIX slider cable specifications

U-MIXRCBL (for BX3M-CB)

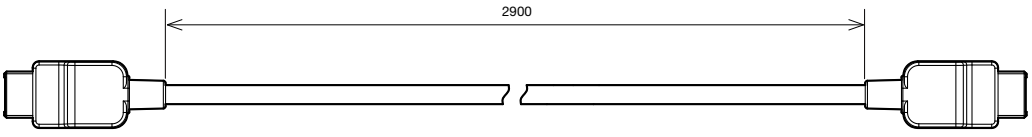
Length: 0.54 m Weight: 20 g
Outer Dimension



MIX slider cable specifications

U-MIXRECBL (for BX3M-CBFM)

Length: 2.9 m Weight: 95 g
Outer Dimension



Unit: mm

Light Source Units

Lamp Housings

A variety of different lamp housings are available for use with different light sources, enabling users to choose the most appropriate housing for their application.

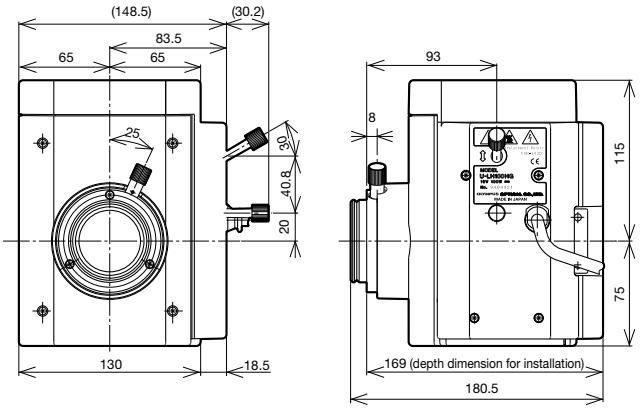
For customers who use these units in a production line, please consult your nearest Evident representative to discuss your specific needs.

U-LH100HGAPO

100 W Mercury Apo Lamp Housing

U-LH100HG

100 W Mercury Lamp Housing

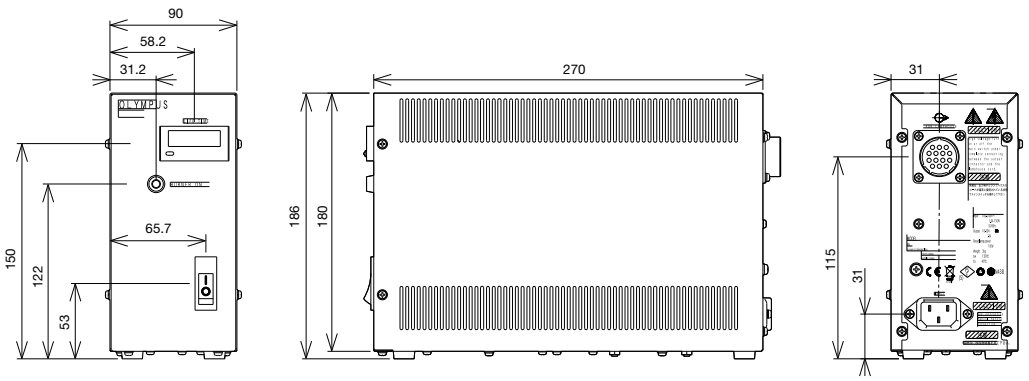


*Power supply unit (U-RFL-T) and power cable (UYCP) are required for the 100 W mercury lamp housings. These items are sold separately.

Cable Length : 2,000 mm Accepted Lamp: USH-103OL Weight: 2.7 kg

U-RFL-T

Power Supply Unit for Mercury Lamp



Weight: Approximately 3 kg

Unit: mm

Light Source Units

Halogen Lamp Housings

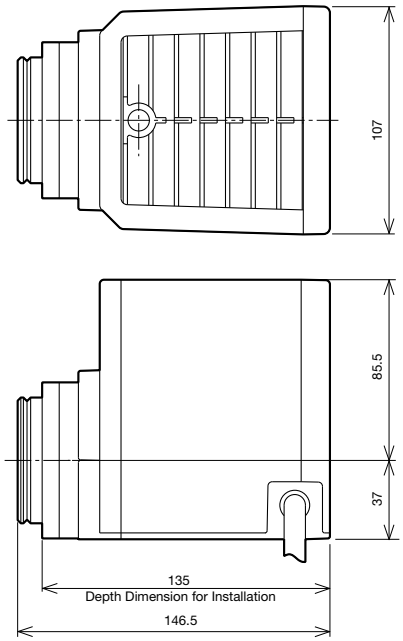
The external power supply for the 100 W halogen lamp (TH4-100/200) features an intensity adjustment knob and an on/off switch, both located close to the operator's hand for increased comfort.

For customers who use these units in a production line, please consult your nearest Evident 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

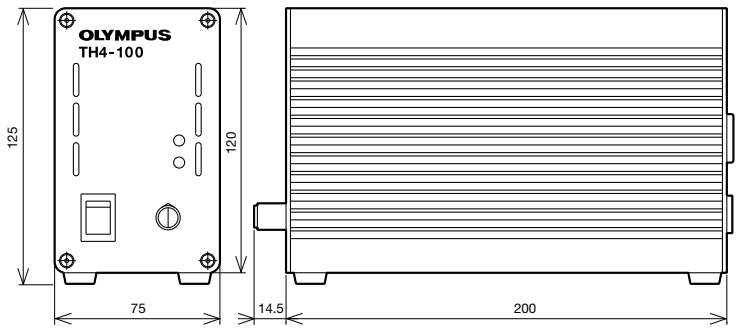
Accepted Lamp: 12V100WHAL (high-intensity lamp)
12V100WHAL-L (long-life lamp)

*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

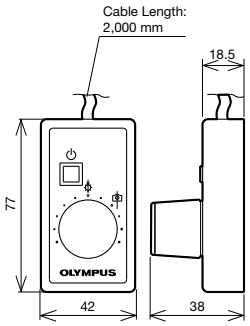
External Power Supply



Weight: 2.2 kg

TH4-HS

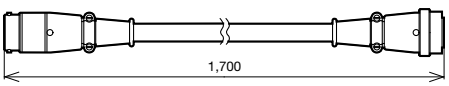
Hand Switch



Weight: 140 g

U-RMT

Extension Cord



Weight: 200 g

Unit: mm

Light Source Units

Fiber Illumination Accessories

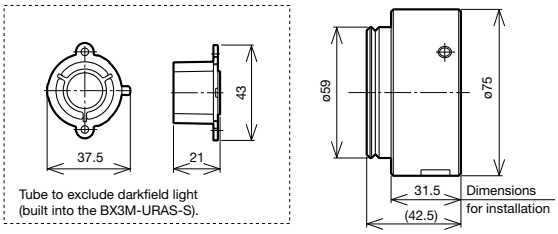
All our reflected light illuminators can be used with fiber illumination.

For customers who use these units in a production line, please consult your nearest Evident 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

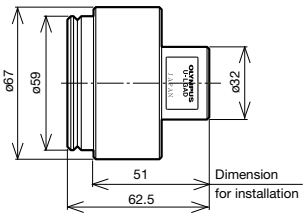
DF Converter for BX3M-URAS-S



Weight: 315 g

U-LGAD

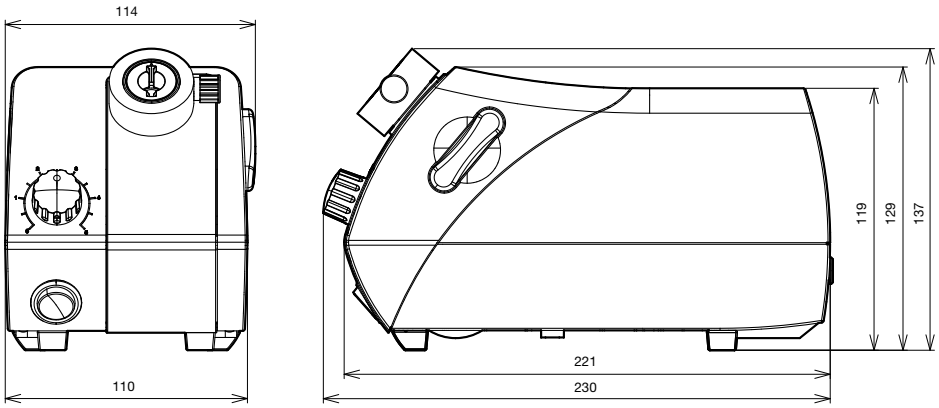
Fiber Adaptor for Reflected Light Observation



Light Guide Mount Hole ø12; Weight: 390 g

LG-LSLED

LED Light Source

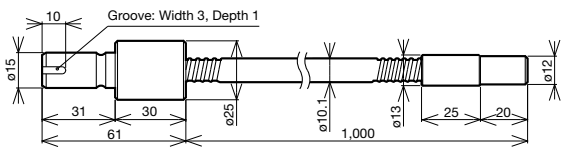


*The types of models in use varies by country.

Weight: 1.6 kg

LG-SF

Light Guide



Weight: 210 g

Unit: mm

Light Source Units

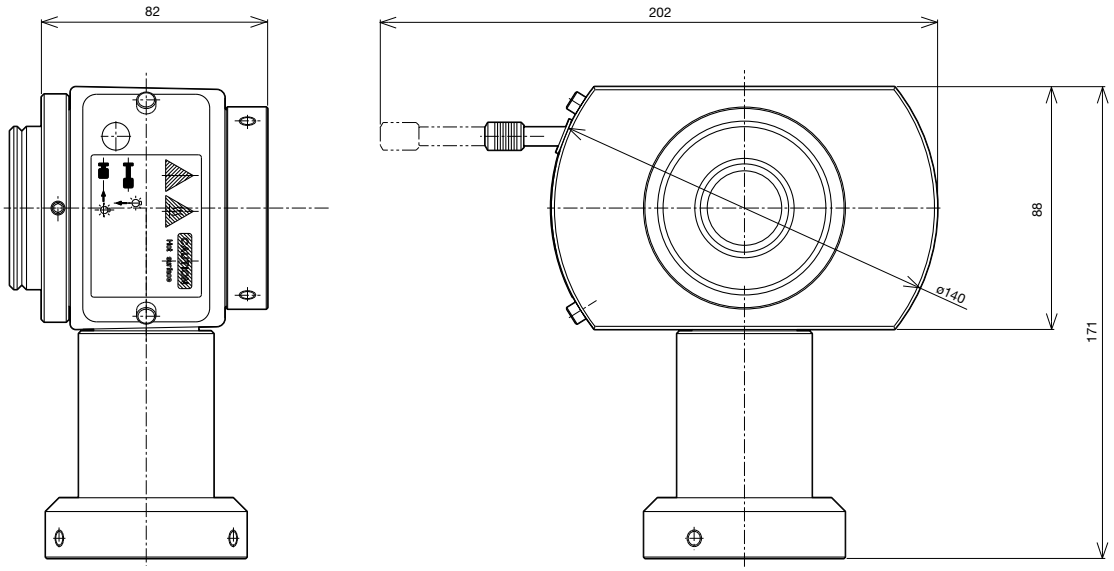
Lamp Housing Accessory

Two lamp housings can be attached simultaneously.

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

U-DULHA

Double Lamp House Adaptor



Weight: 1.2 kg

Unit: mm

Condenser Units

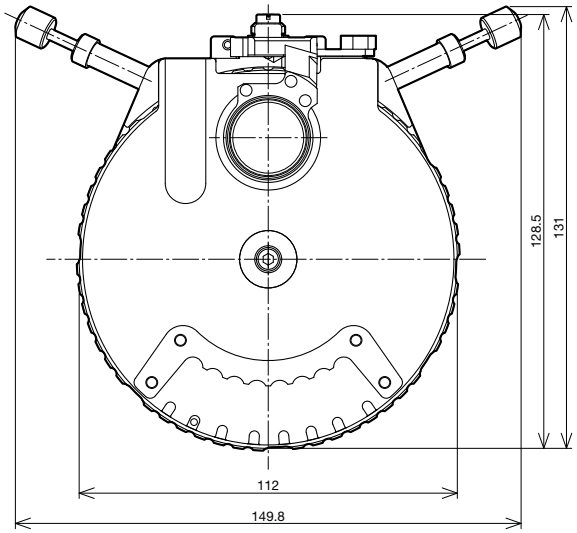
Universal Condenser

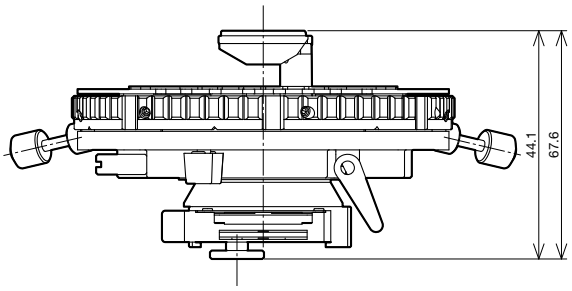
U-UCD8

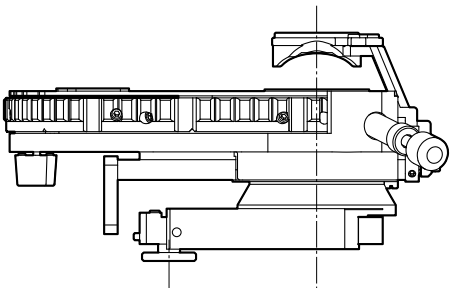
The universal condenser contains 8 optical element slots.

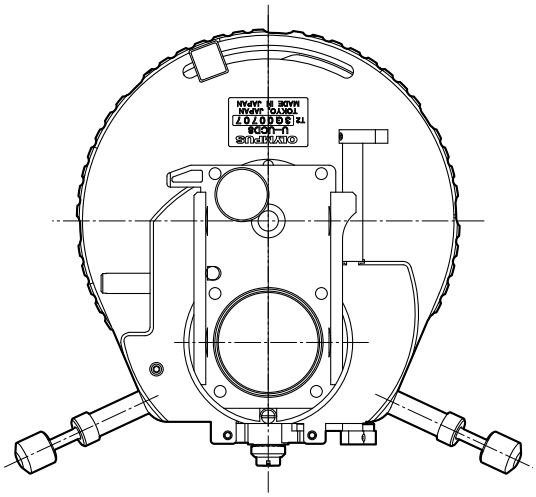
*Optical elements are required. Please consult your local Evident representative for information about different optical element combinations.

U-UCD8









Weight: 700 g

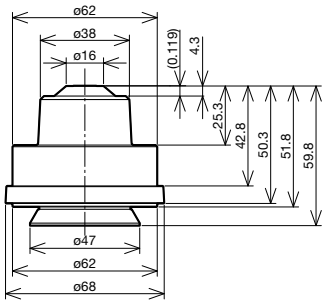
Unit: mm

Condenser Units

Condenser

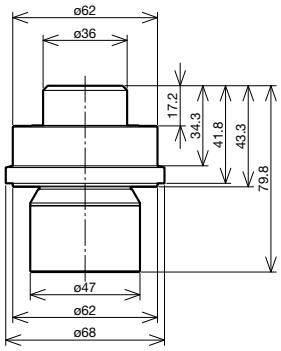
Condensers for different applications: brightfield, and long working distance.

U-AC2-7
Abbe Condenser



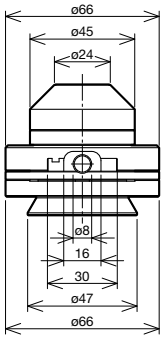
Weight: 174 g

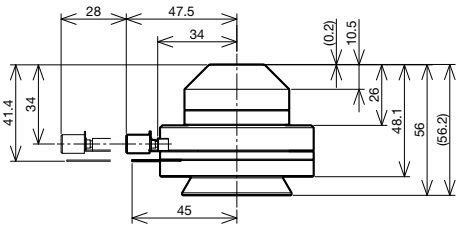
U-LWCD
Long Working Distance Condenser



Weight: 380 g

WI-OBCD
Long Working Distance Oblique Condenser





Weight: 530 g

Unit: mm

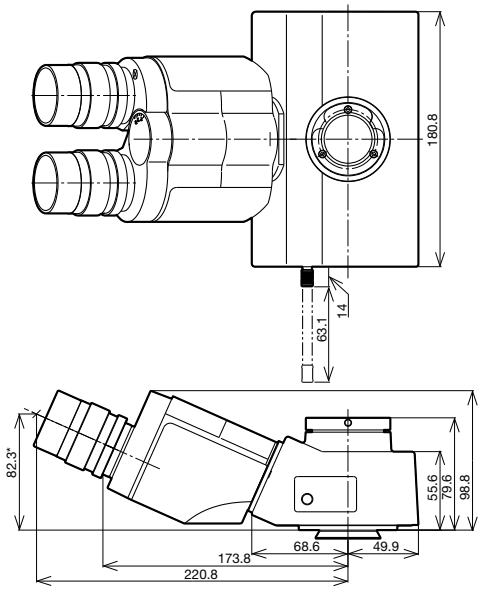
Observation Tubes

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.

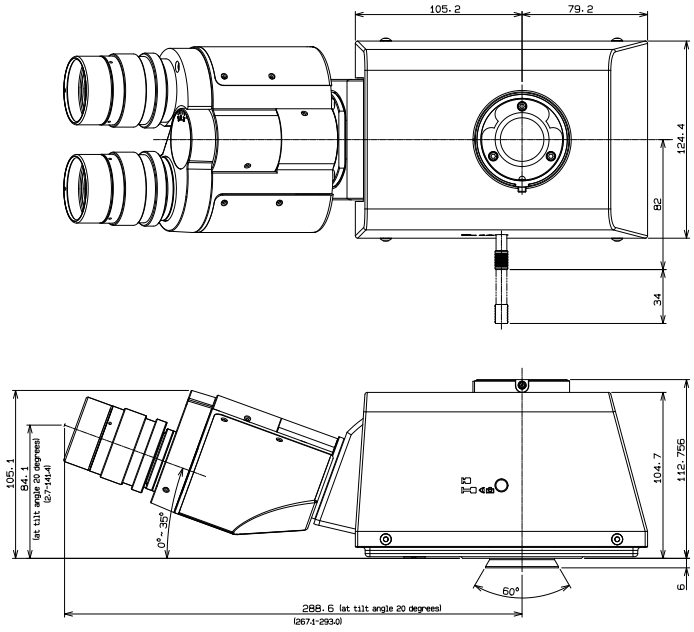
U-SWTR-3

Super Widefield Trinocular Tube



U-SWETTR-5

Super Widefield Erect Image Tilting Trinocular Tube



Unit: mm

Name	FN	Inclination Angle (degrees)	Interpupillary Distance (mm)	Light Path Selector (eyepiece/camera port)	Observation Image	Weight (g)
U-SWTR-3	26.5	24	50–76	100/0, 20/80, 0/100	Inverted	2300
U-SWETTR-5	26.5	0–35	50–76	100/0, 20/80	Erect	4200

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

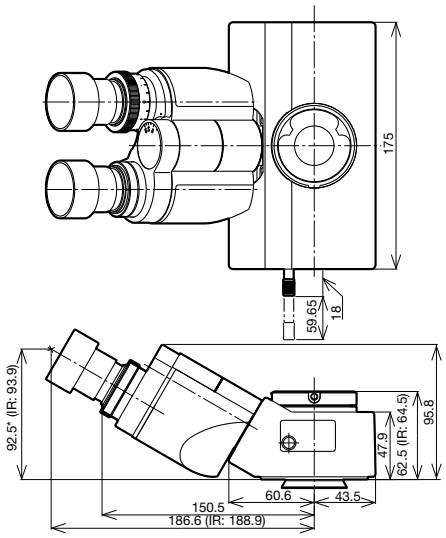
Observation Tubes

Widefield Trinocular Observation Tubes

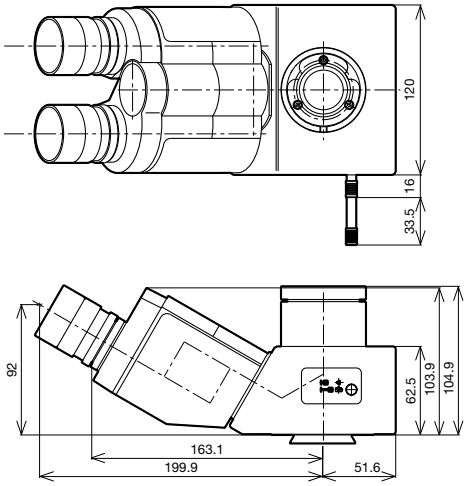
Trinocular observation tubes with wide field of view. These tubes are compatible with objectives up to FN 22.

U-TR30-2
Widefield Trinocular Tube

U-TR30IR
Widefield Trinocular Tube for IR



U-ETR-4
Widefield Erect Image Trinocular Tube



Unit: mm

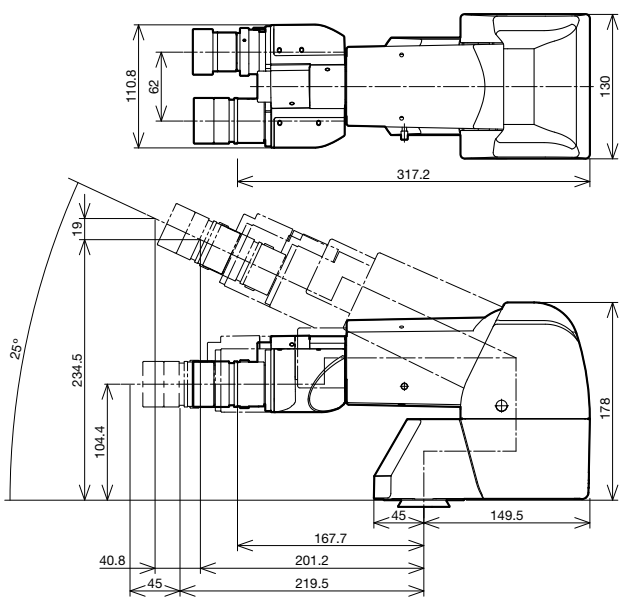
Name	FN	Inclination Angle (degrees)	Interpupillary Distance (mm)	Light Path Selector (eyepiece/camera port)	Observation Image	Weight (g)
U-TR30-2	22	30	50–76	100/0, 20/80, 0/100	Inverted	1600
U-TR30IR	22	30	50–76	100/0, 0/100	Inverted	1600
U-ETR-4	22	30	50–76	100/0, 0/100	Erect	1900

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

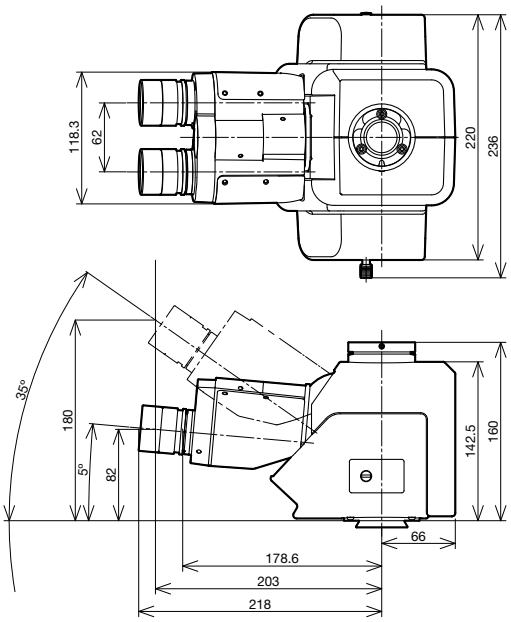
Observation Tubes

Tilting Binocular and Trinocular Tube

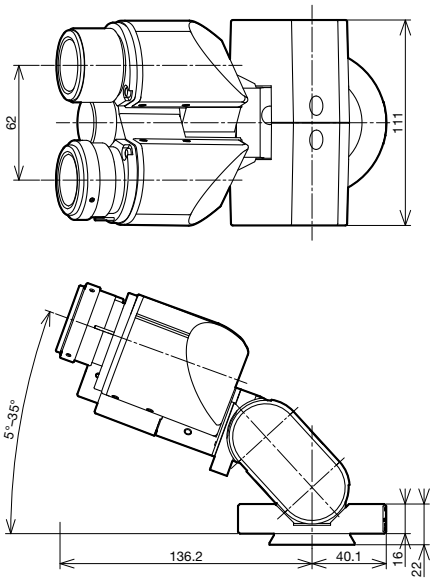
U-TTBI
Telescopic Tilting Binocular Tube



U-TTR-2
Tilting Trinocular Tube



U-TBI-3
Tilting Binocular Tube



Unit: mm

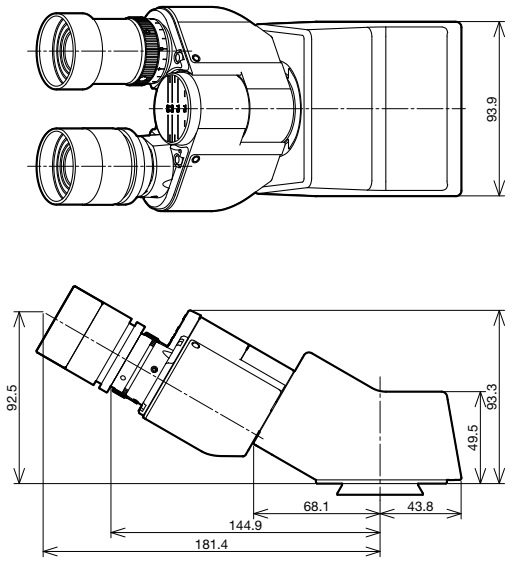
Name	FN	Inclination Angle (degrees)	Interpupillary Distance (mm)	Light Path Selecter (eyepiece/camera port)	Observation Image	Weight (g)
U-TTBI	22	0–25	50–76	NA	Inverted	3800
U-TTR-2	22	5–35	50–76	100/0, 0/100, 50/50	Inverted	3200
U-TBI-3	22	5–35	50–76	NA	Inverted	1300

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

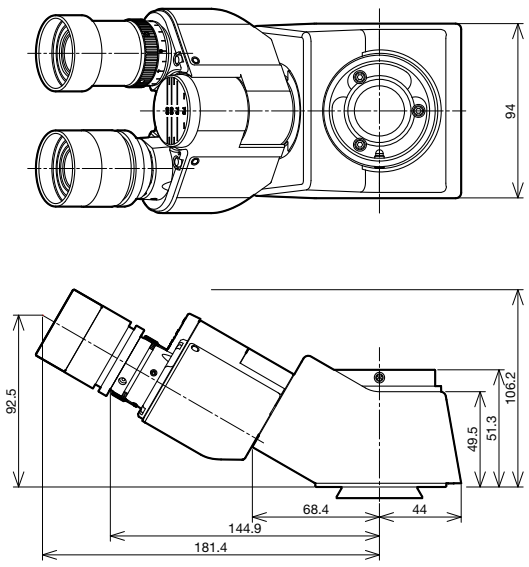
Observation Tubes

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/camera port)	Observation Image	Weight (g)
U-CBI30-2	20, 18(*)	30	48–75	NA	Inverted	800
U-CTR30-2	20, 18(*)	30	48–75	50/50	Inverted	900

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

Intermediate Tubes and Accessories

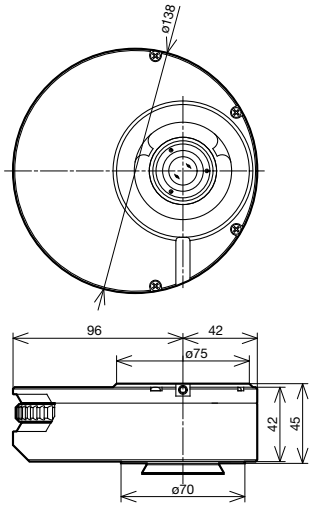
Intermediate Tubes

We make various accessories to satisfy a wide variety of observation needs.

U-CA

Magnification Changer

Provides 1X, 1.25X, 1.6X, and 2X intermediate magnifications.

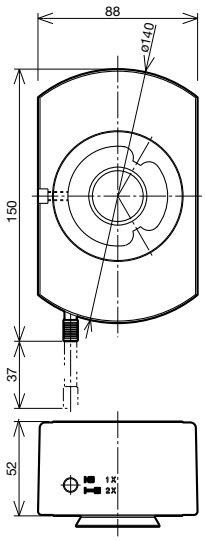


Weight: 1.3 kg

U-ECA

Magnification Changer

Provides 1X and 2X intermediate magnifications.

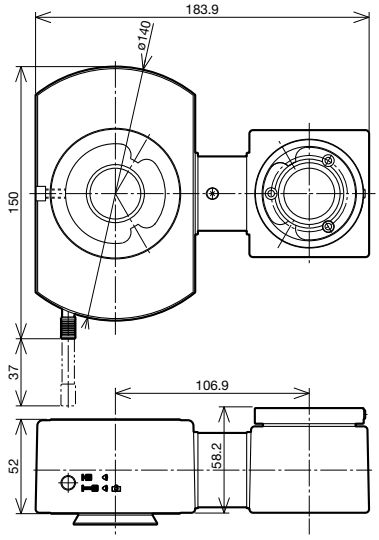


Weight: 1.3 kg

U-TRU

Trinocular Intermediate Attachment

The intermediate attachment divides the light path, enabling users to attach cameras.



BI:PT=100:0/20:80

Weight: 1.3 kg

Unit: mm

Intermediate Tubes and Accessories

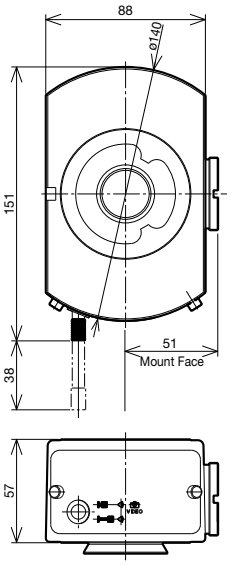
Intermediate Tubes

We make 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

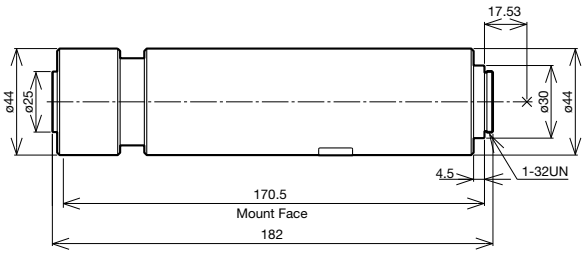
Transmitted Side Port: Side Port = 100:0

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.

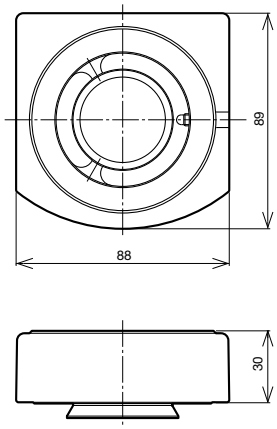


Weight: 500 g

U-EPA2

Eyepoint Adjuster

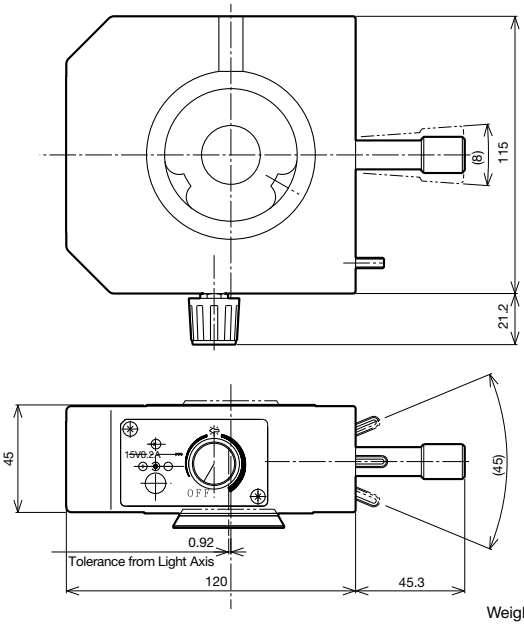
This component rases the eyepoint by 30 mm.



Weight: Approximately 500 g

U-APT

Arrow Pointer



Weight: 1.2 kg

Unit: mm

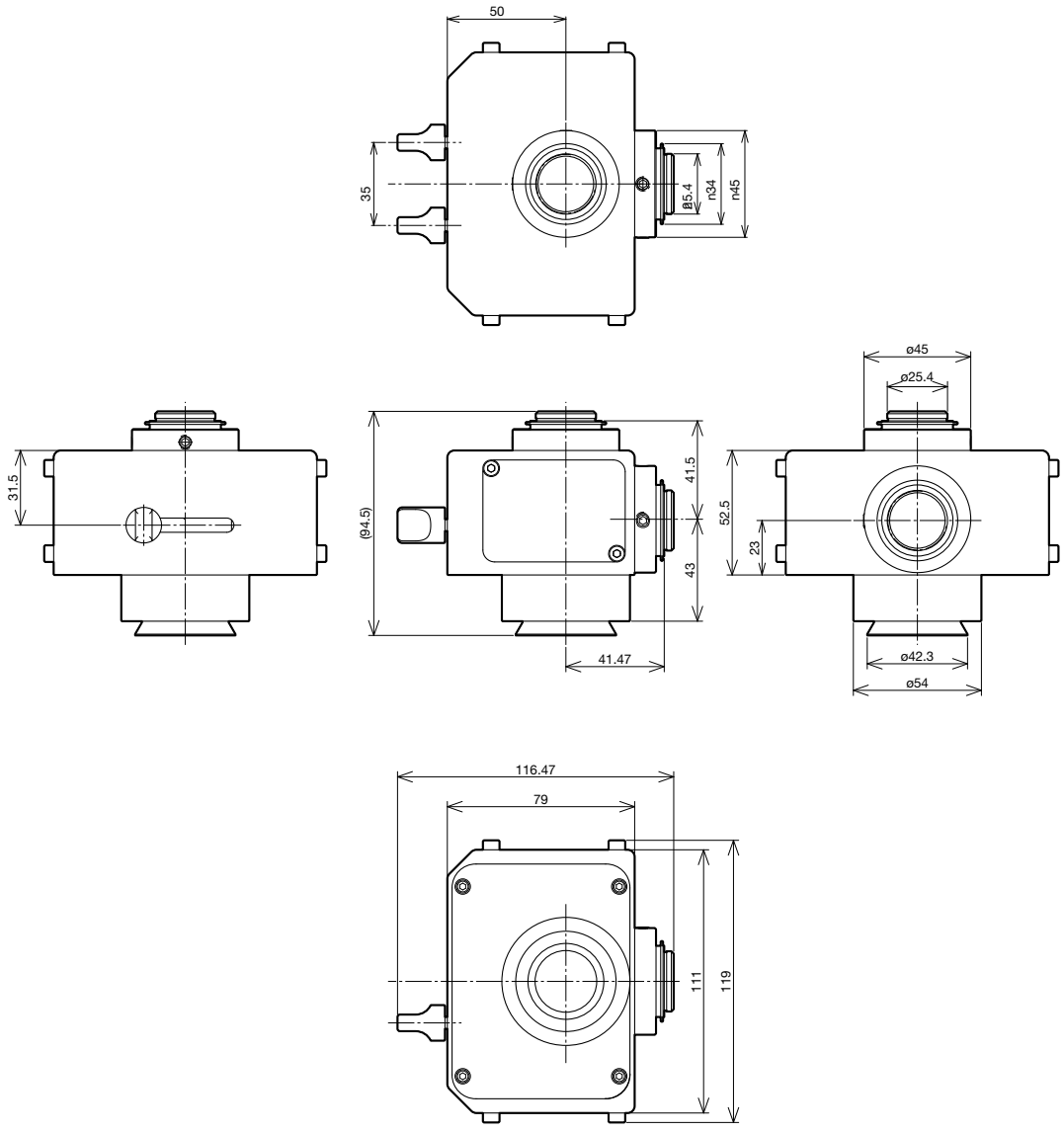
Intermediate Tubes and Accessories

Dual Port Tube with C-Mounts

U-DPCAD

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

U-DPCAD



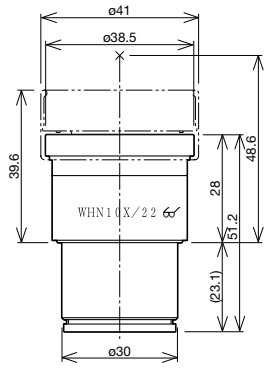
Weight: 0.9 kg Unit: mm

Eyepieces

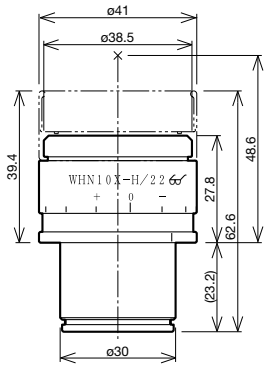
Eyepieces

Eyepieces for the UIS2 optical system.

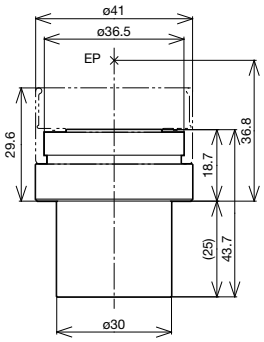
WHN10X
Widefield Eyepiece



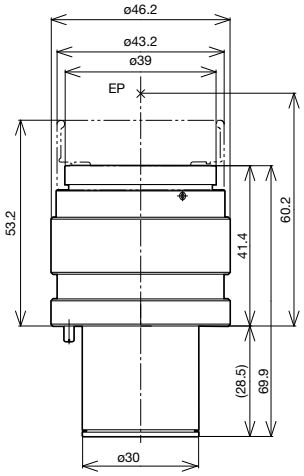
WHN10X-H
CROSSWHN10X
Widefield Eyepieces



WH15X
Widefield Eyepiece



SWH10X-H
MICRO-SWH10X
CROSS-SWH10X
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
MICRO-SWH10X	26.5	-8–+2	—	210	With micrometer and adjustable diopter
CROSS-SWH10X	26.5	-8–+2	—	210	With cross lines and adjustable diopter

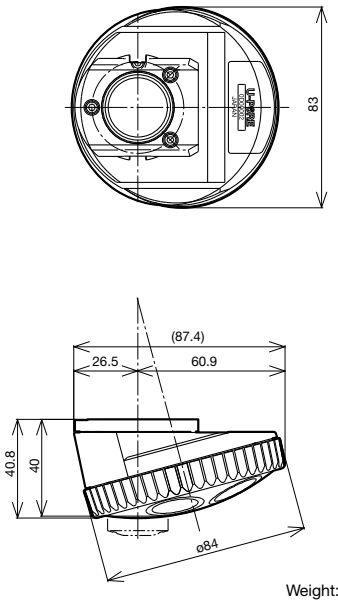
*EP=eyepoint

Revolving Nosepieces

Revolving Nosepieces for BF Objectives

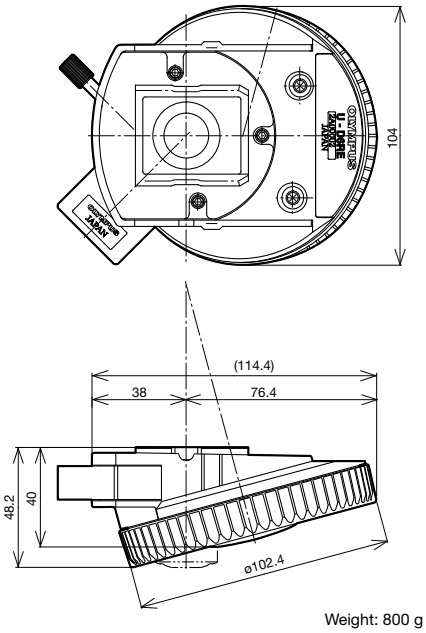
Users can choose from the 5 revolving nosepieces for BF objectives shown below. For motorized nosepieces, please refer to the motorized unit page.

U-5RE-2
Quintuple Revolving Nosepiece



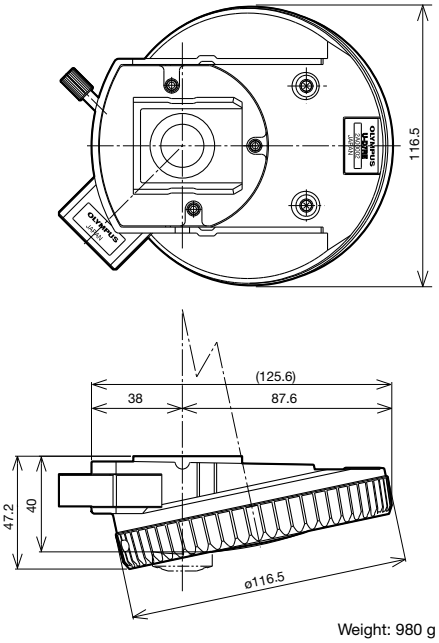
Weight: 520 g

U-D6RE
Septuple Revolving Nosepiece
with Slider Slot for DIC



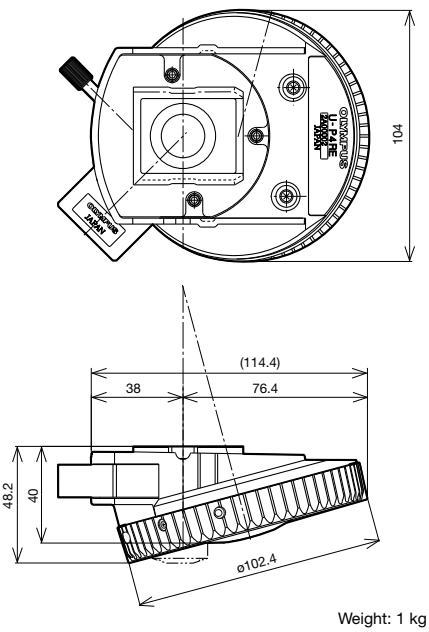
Weight: 800 g

U-D7RE
Septuple Revolving Nosepiece
with Slider Slot for DIC



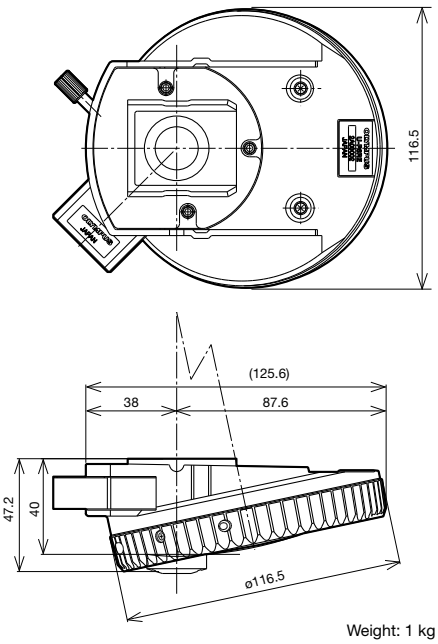
Weight: 980 g

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

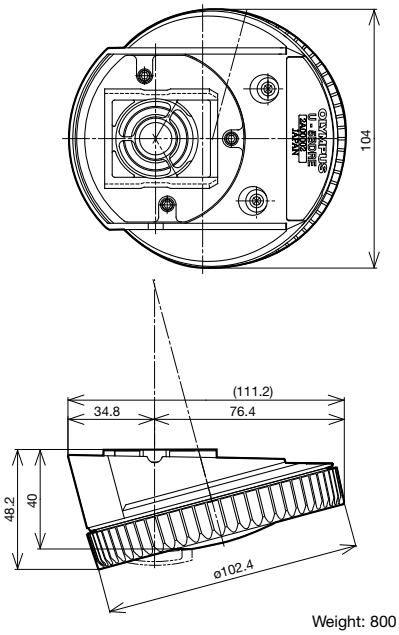
Insert the DIC dummy when not using the DIC slider. Unit: mm

Revolving Nosepieces

Revolving Nosepieces for BF/DF Objectives

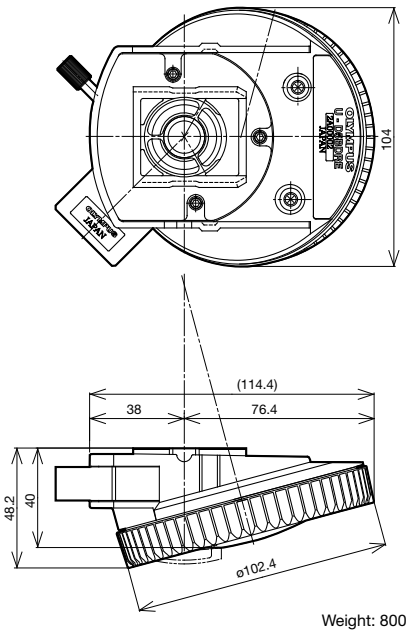
Users can choose from the following 3 types of revolving nosepieces for BF/DF objectives. To attach brightfield objectives, users must use the BF adaptor (BD-M-AD). For motorized nosepieces, please refer to the motorized unit page.

U-5BDRE
Quintuple Revolving Nosepiece for BF/DF



Weight: 800 g

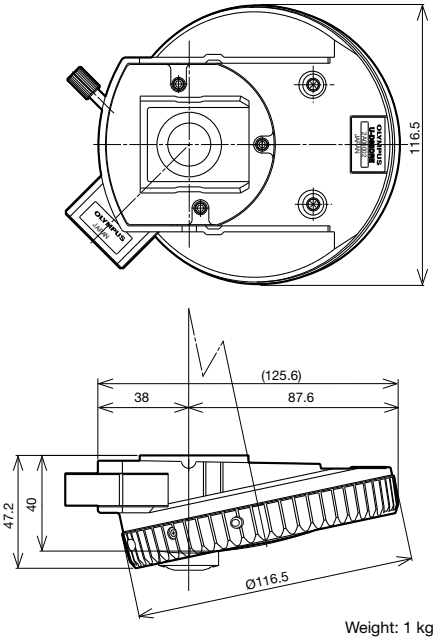
U-D5BDRE
Quintuple Revolving Nosepiece for BF/DF with Slider Slot for DIC



Weight: 800 g

U-P5BDRE
Centerable Quintuple Revolving Nosepiece with Slider Slot for DIC

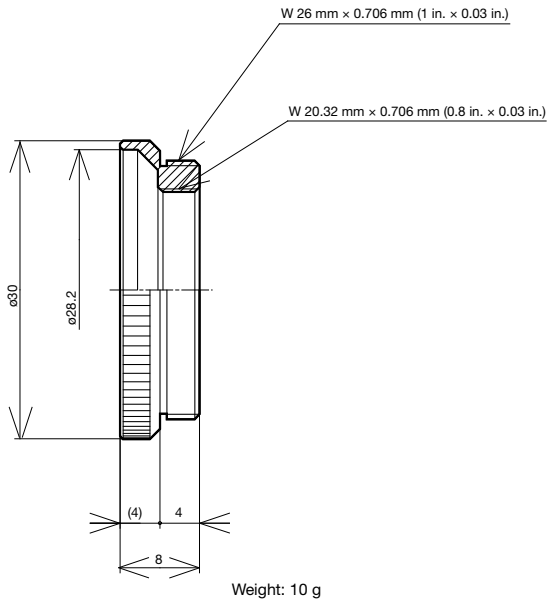
U-D6BDRE
Sextuple Revolving Nosepiece for BF/DF with Slider Slot for DIC



Weight: 1 kg

Insert the DIC dummy when not using the DIC slider.

BD-M-AD
Adaptor to Mount BF Objectives



Weight: 10 g

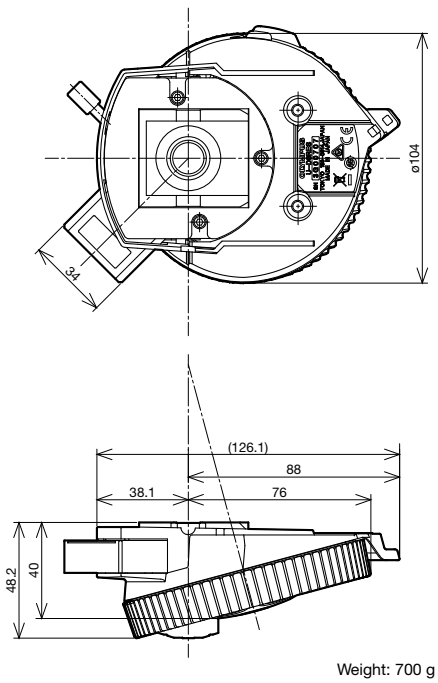
Unit: mm

Revolving Nosepieces

Coded Sextuple Revolving Nosepiece

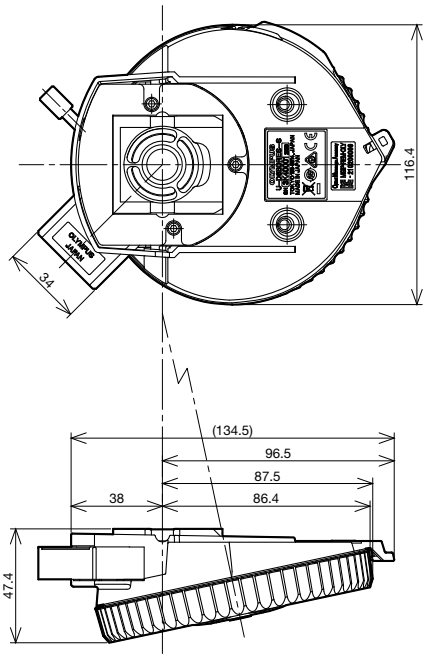
Coded nosepieces for BF, DF, and DIC applications.

U-D6RES
Coded Sextuple Revolving Nosepiece with Slider Slot for DIC



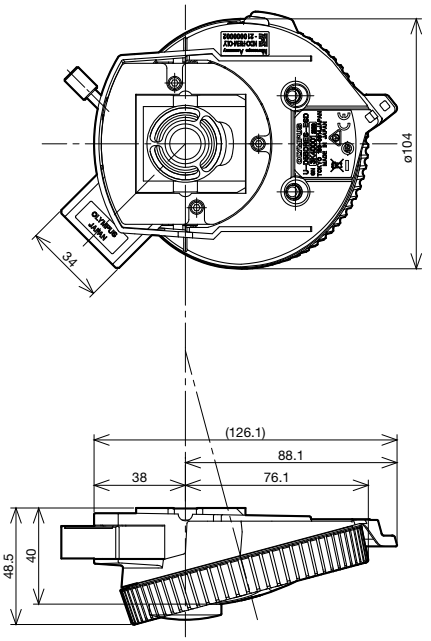
Weight: 700 g

U-D6BDRES-S
Coded Sextuple BF/DF Revolving Nosepiece with Slider Slot for DIC



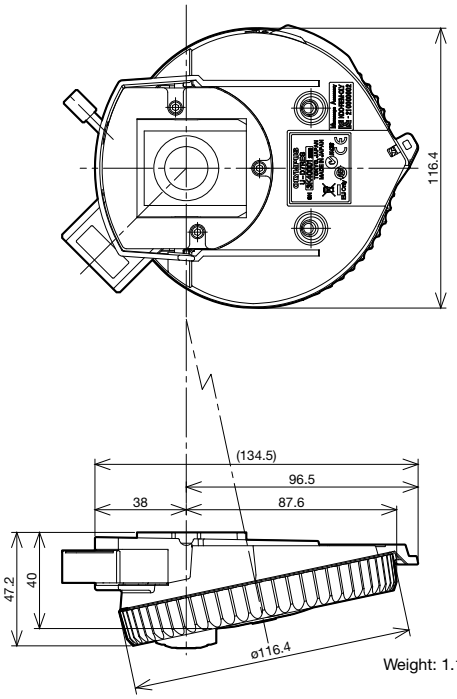
Weight: 900 g

U-D5BDRES-ESD
ESD-Resistant Coded Quintuple BF/DF Revolving Nosepiece with Slider Slot for DIC



Weight: 750 g

U-D7RES
Coded Septuple Nosepiece with Slider Slot for DIC



Weight: 1.1 kg

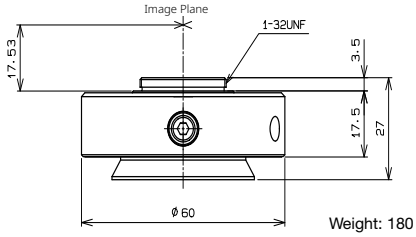
Unit: mm

Camera Adaptors

C-Mount Camera Ports

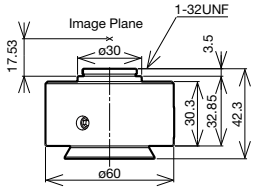
Enables users to directly attach a C-mount camera. Four types are provided: 1X, 0.63X, 0.5X, and 0.35X. All models feature a focus adjustment function.

U-TV0.35XC-2
C-Mount Camera Port with 0.35X Lens



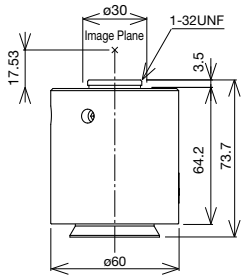
Weight: 180 g

U-TV0.5XC-3
C-Mount Camera Port with 0.5X Lens



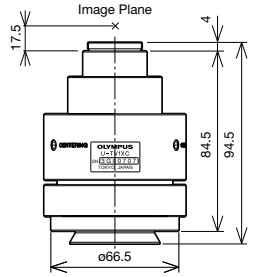
Weight: 260 g

U-TV0.63XC
C-Mount Camera Port with 0.63X Lens

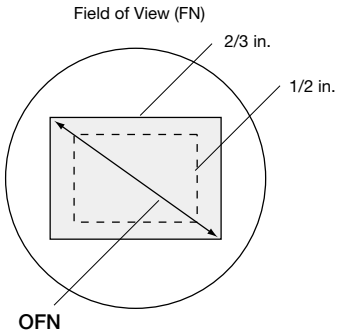


Weight: 390 g

U-TV1XC
C-Mount Camera Port



Weight: 300 g



Camera Adaptor (projection lens)	Projection Magnification	OFN			
		1 in.	2/3 in.	1/2 in.	1/3 in.
U-TV1X-2 + U-CMAD3	1X	16	11	8	6
U-TV1XC	1X	16	11	8	6
U-TV0.63XC	0.63X	25.4	17.5	12.7	9.5
U-TV0.5XC-3	0.5X	—	22	16	12
U-TV0.35XC-2	0.35X	—	—	22	17.1

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

Adjust the focus on the camera adaptor to help keep the eyepiece image in focus when switching magnification.
Typically, the camera adaptor is focused by switching to a low magnification after focusing at a high magnification.

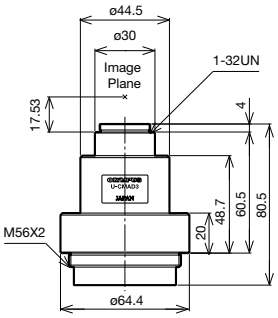
Unit: mm

Camera Adaptors

Camera Mount Adaptors

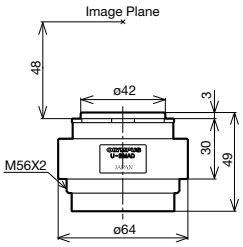
These camera mount adaptors enable users to attach cameras with C, B4, and F-mounts. Use these adaptors with the U-TV1X-2. Focus by amount of screwing into U-TV1X-2.

U-CMAD3
C-Mount Adaptor



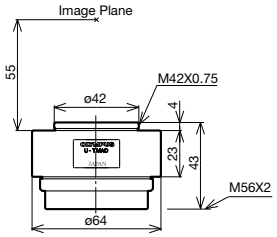
Weight: 165 g

U-BMAD
B4 Mount Adaptor



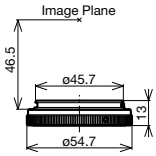
Weight: 80 g

U-TMAD
T-Mount Adaptor



Weight: 70 g

U-FMT
F/T-Mount Adaptor *



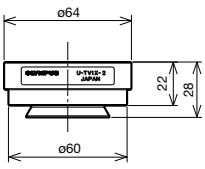
*This adaptor must be combined with U-TMAD.

Weight: 30 g

Camera Port

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

U-TV1X-2
Camera Adaptor 1X



Weight: 80 g

Unit: mm

Motorized Units

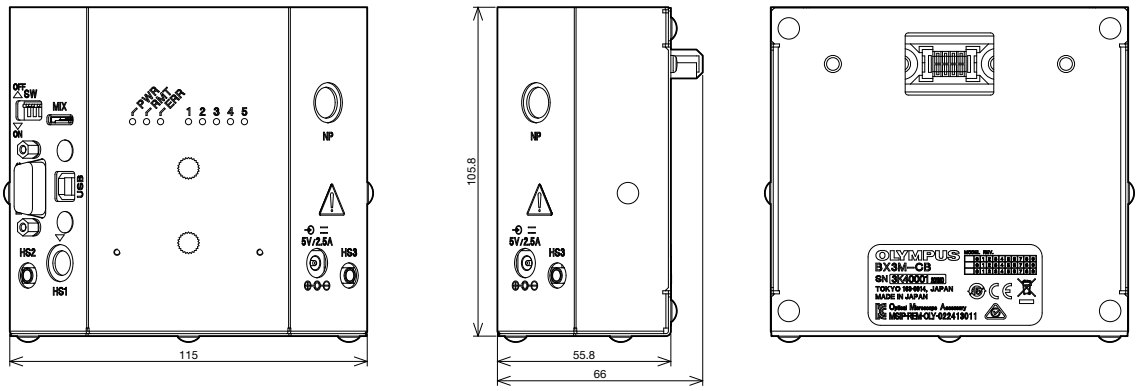
Control Box for the BX53M/BXFM Microscope

BX3M-CB

Control Box for the BXFM Microscope

The control box can be connected to a PC using an RS232 or USB 2.0 cable (attached to the microscope frame).

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



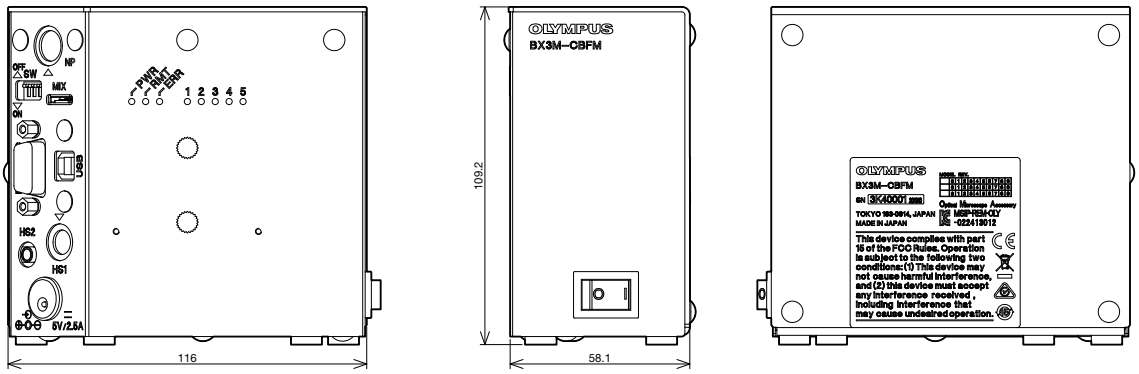
Weight: 0.49 kg

BX3M-CBFM

Control Box for the BX53M Frame

The control box can be connected to a PC using an RS232 or USB 2.0 cable (attached to the microscope frame).

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

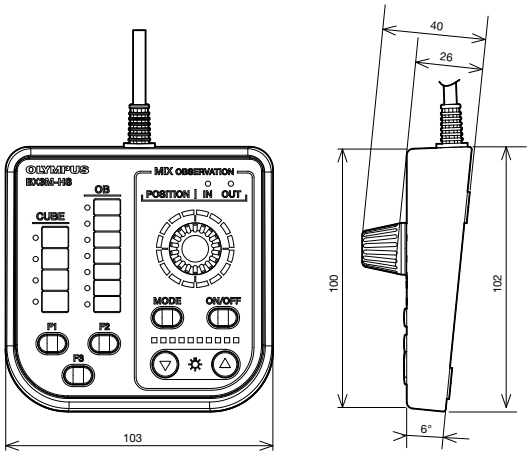


Weight: 0.67 kg

BX3M-HS

Hand Switch

MIX observation control, indicator of coded hardware, programmable function button of software.

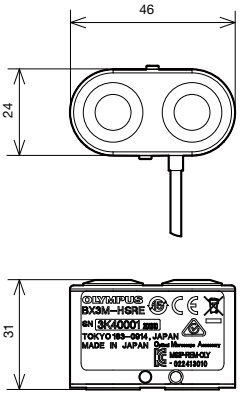


Weight: 200 g

BX3M-HSRE

Hand Switch

Motorized nosepiece rotation



Weight: 60 g

Unit: mm

Motorized Units

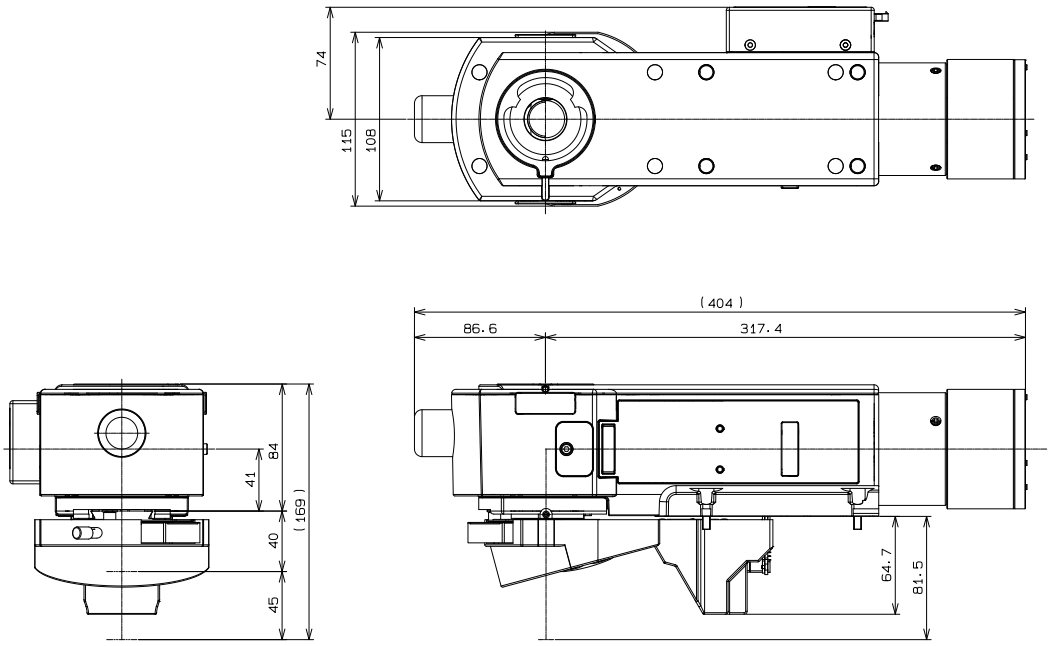
Compact Reflected Illuminator for BF/DF for the BXC-CBB System

These various motorized units are used to help automate equipment.

BXC-RLI / BXC-RLI-CA + U-D5BDREMC + BX3M-LEDR

Motorized BF/DF Reflected Light Illuminator + Motorized Quintuple BD Revolving Nosepiece with SliderSlot for DIC + LED Light Source

These components motorize the exchange of objectives, the selection of brightfield and darkfield observation, and the opening and closing of the aperture diaphragm. The BXC-CBB 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 BXC-RLI.



Weight: 4.9 kg (excludes objectives)

Unit: mm

Motorized Units

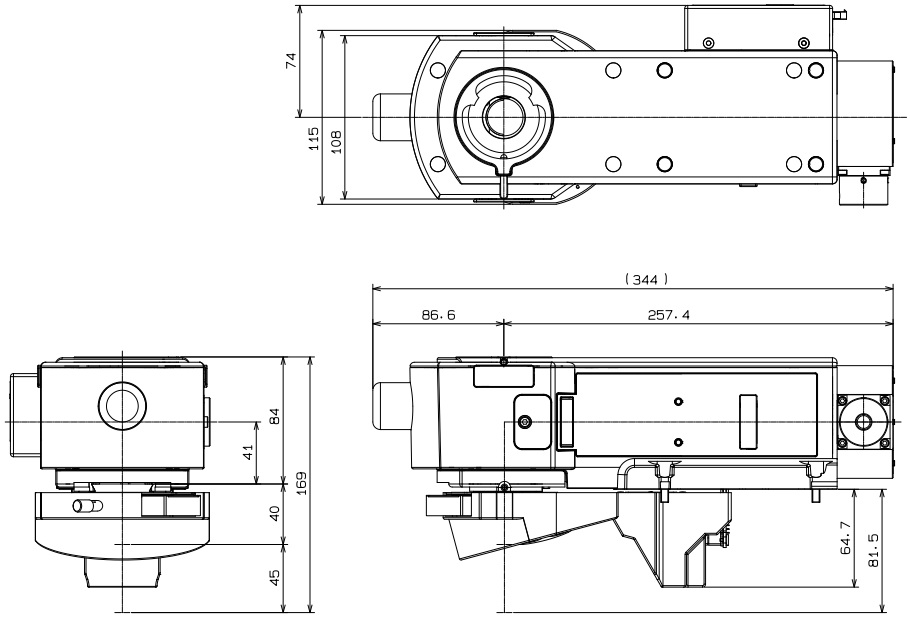
Compact Reflected Illuminator for BF/DF for the BXC-CBB System

These various motorized units are used to help automate equipment.

BXC-RLI-LGCA + U-D5BDREMC

Motorized Light Guide Reflected Light Illuminator with Clean Lens for AS + Motorized Quintuple BD Revolving Nosepiece with SliderSlot for DIC

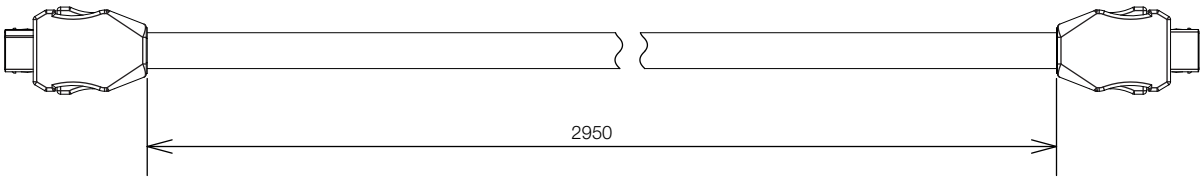
These components motorize the exchange of objectives, the selection of brightfield and darkfield observation, and the opening and closing of the aperture diaphragm. A light guide, which must be prepared by the user, is also available. The BXC-CBB control unit has an RS232C connector, enabling control via a PC. For instructions on how to attach an illuminator, please refer to the mounting directions for the BXC-RLI.



Weight: 4.4 kg

BXC-LCBL3M

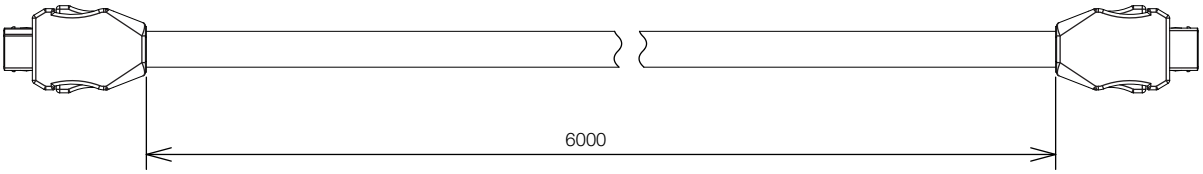
Link Cable 3 m



Weight: 240 g

BXC-LCBL6M

Link Cable 6 m



Weight: 470 g

Unit: mm

Motorized Units

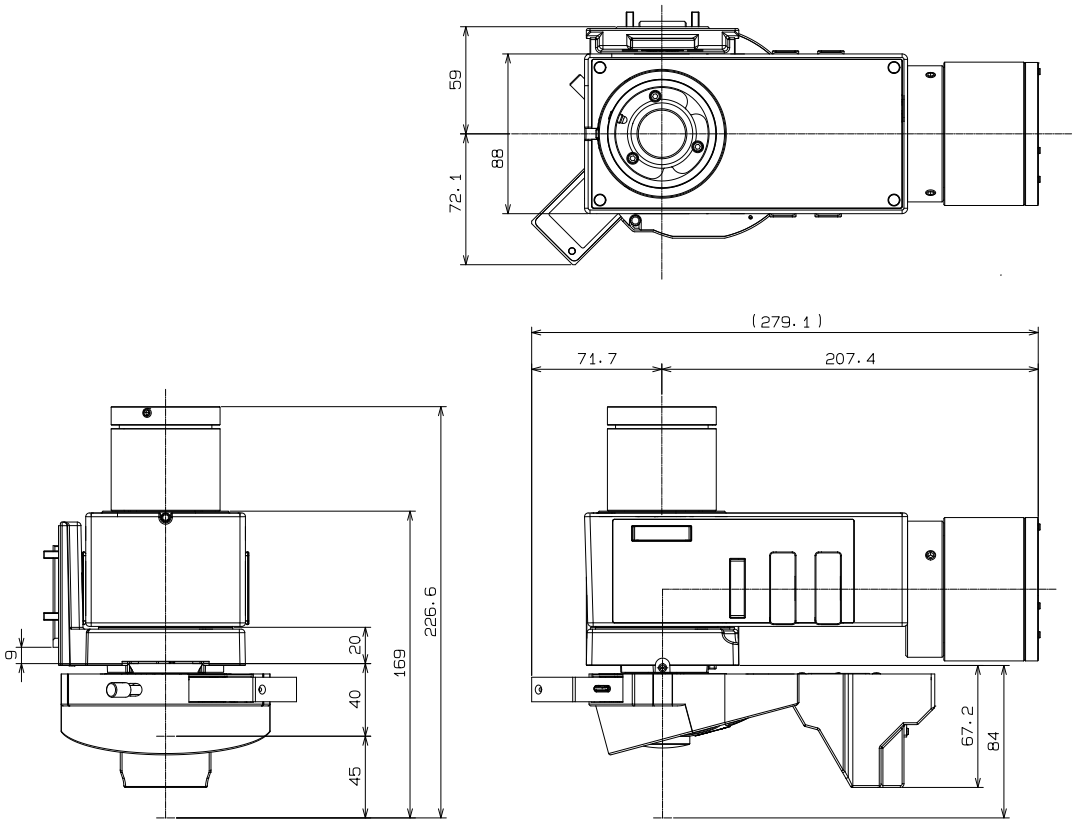
Motorized Reflected Illuminator for BF/DF for the BXC-CBRML System

These various motorized units are used to help automate equipment.

BXFM-ILHS + U-KMAS + U-D5BDREMC + U-MIXR-2 + BX3M-LEDR + U-TLU

Illuminator Holder for BXFM+Compact Reflected Light Illuminator for BF + Motorized Quintuple BD Revolving Nosepiece with Slider Slot for DIC + MIX Slider for Reflected Light Obervation + Reflected LED Lamp Housing + Single port tube with lens

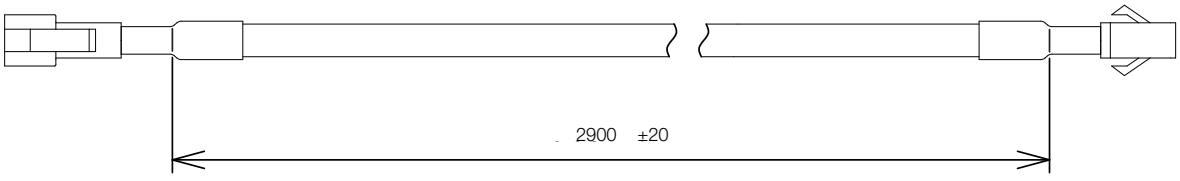
These components motorize the exchange of objectives, the intensity control of brightfield illumination, and control of darkfield illumination using a MIX slider. The BXC-CBRML control unit has an RS232C connector, enabling control via a PC.



Weight: 3.7 kg

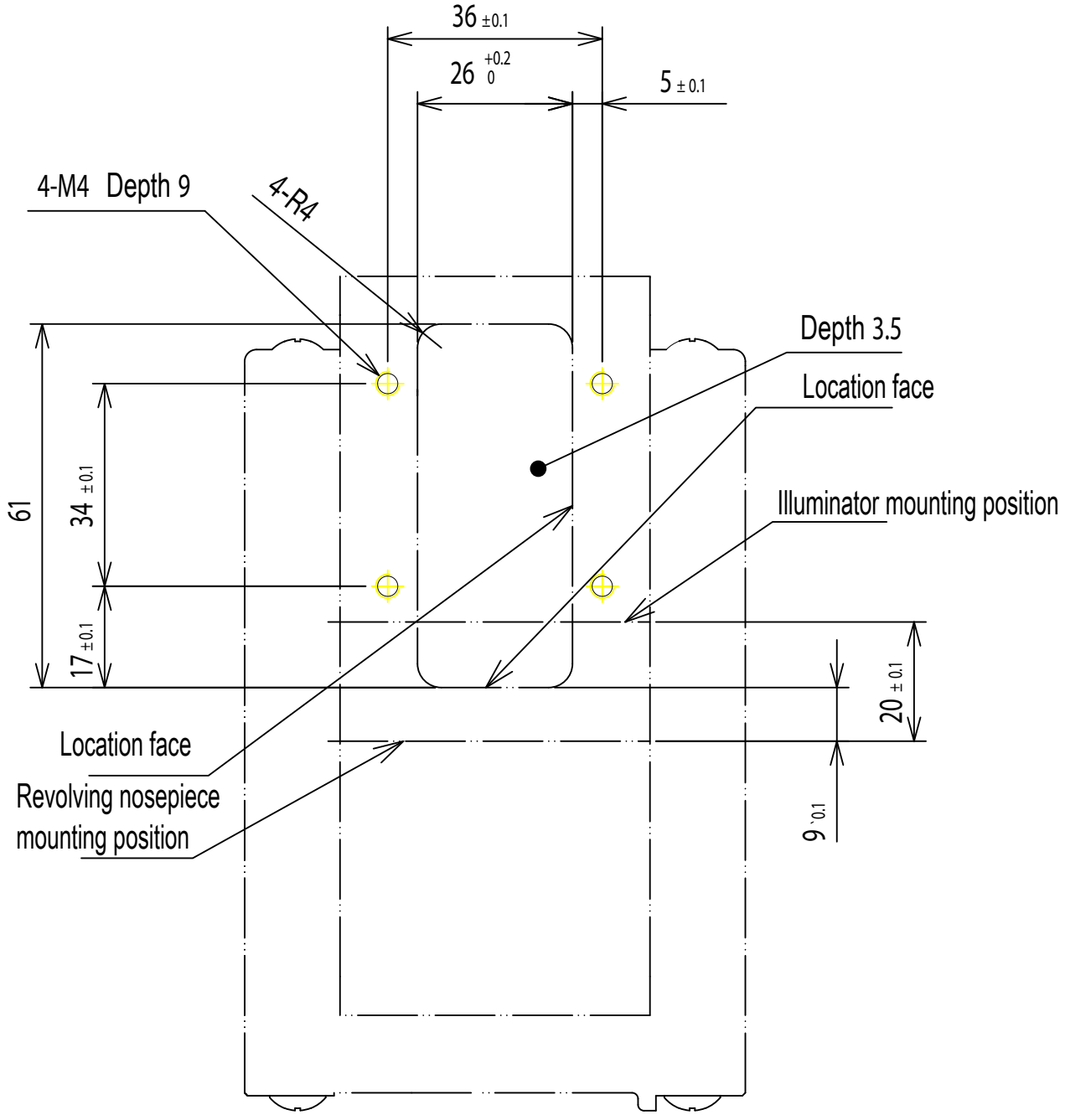
CMP-LLHECBL

LED Extension Cable



Weight: 100 g

Mounting Dimensions of BXFM-ILHS



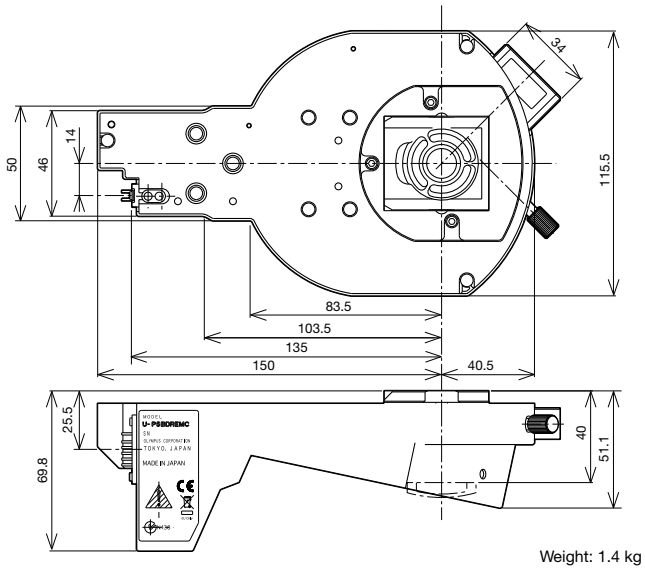
Unit: mm

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

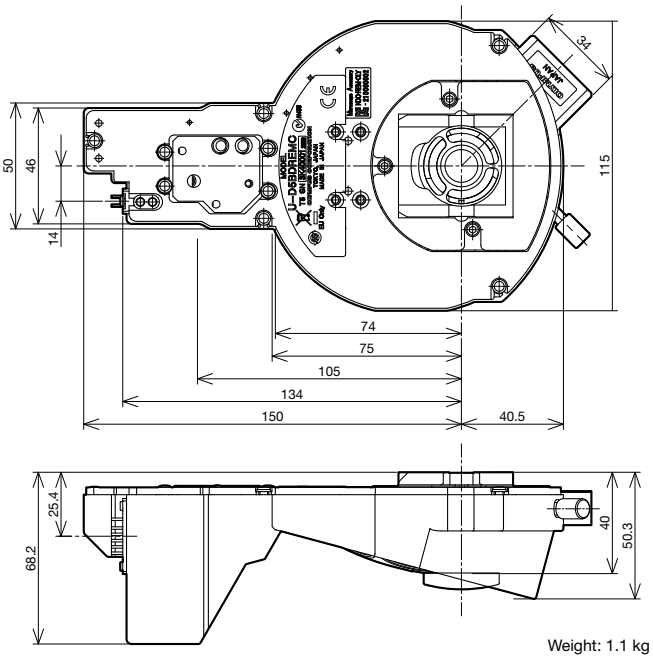


Weight: 1.4 kg

U-D5BDREMC
Motorized Quintuple BD Revolving
Nosepiece with Slider Slot for DIC

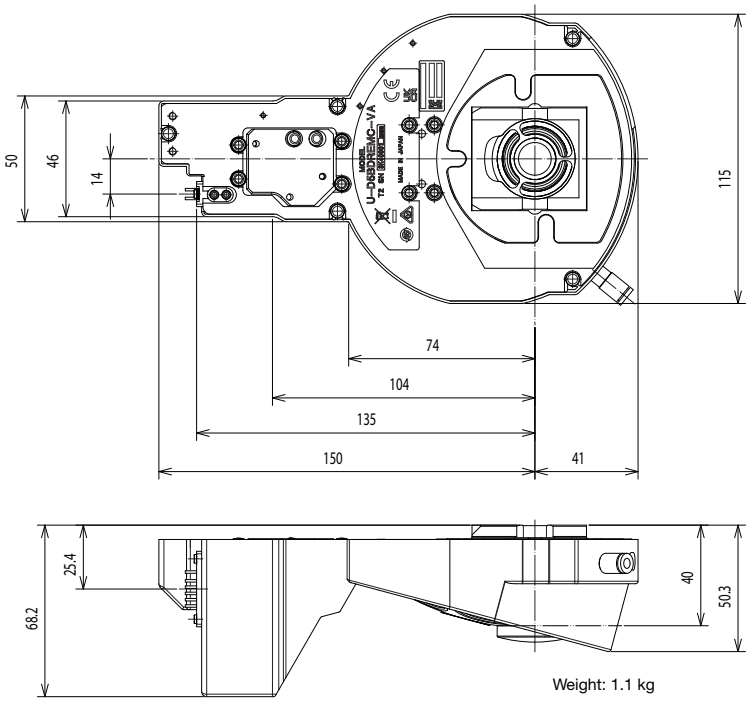
U-D6REMC
Motorized Sextuple Revolving
Nosepiece with Slider Slot for DIC

U-P5REMC
Motorized Centerable Quintuple
Revolving Nosepiece with Slider Slot for DIC



Weight: 1.1 kg

U-D5BDREMC-VA
Motorized Quintuple BD Revolving Nosepiece with Vacuum Function



Weight: 1.1 kg

Unit: mm

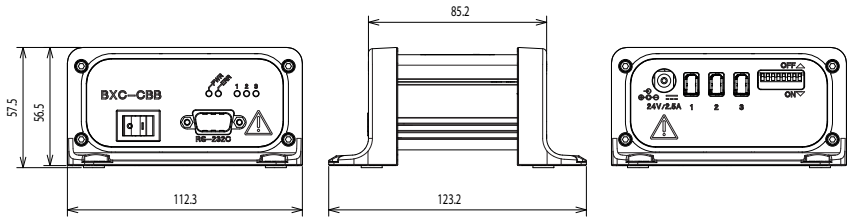
Control Box for the BXC Series

These various motorized units are used to help automate equipment.

BXC-CBB

Control Box for BXC Series

This is a main control box for the BXC-CBB system. It controls a motorized revolving nosepiece, motorized illuminator, LED light source, focus, sensor, etc.

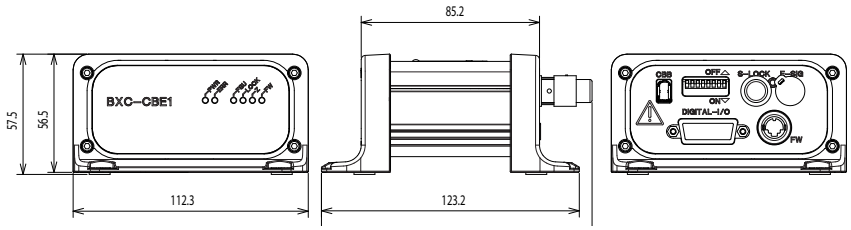


Weight: 390 g

BXC-CBE1

Control Box for BXC Series

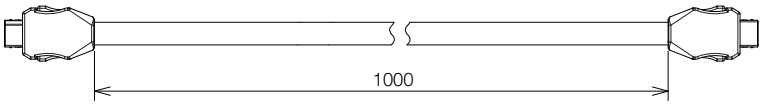
Extension control box that controls the auto focus sensor unit.



Weight: 410 g

BXC-LCBL1M

Link Cable 1 m

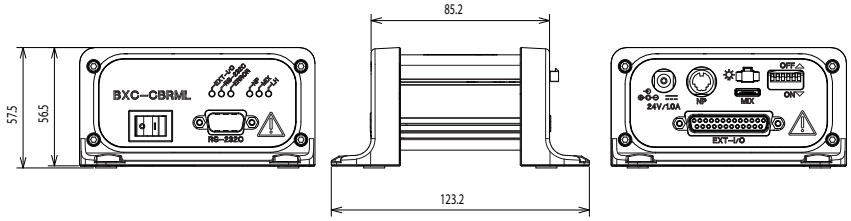


Weight: 90 g

BXC-CBRML

Control Box for BXC Series

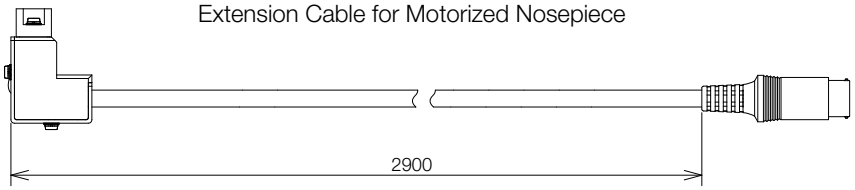
This is a main control box for the BXC-CBRML system. It controls the motorized nosepiece, LED light source, and MIX slider.



Weight: 430 g

BXC-REMECBL

Extension Cable for Motorized Nosepiece



Weight: 130 g

Unit: mm

Motorized Units

Motorized Units for the BXC Series

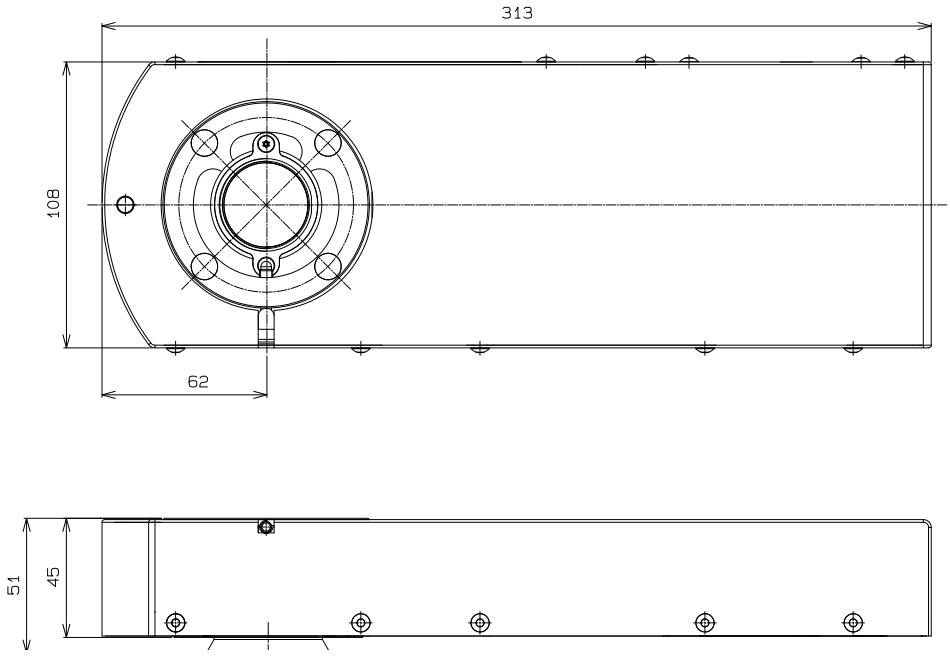
These various motorized units are used to help automate equipment.

BXC-FSU

Autofocus Sensing Unit

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

*Class 1 laser product



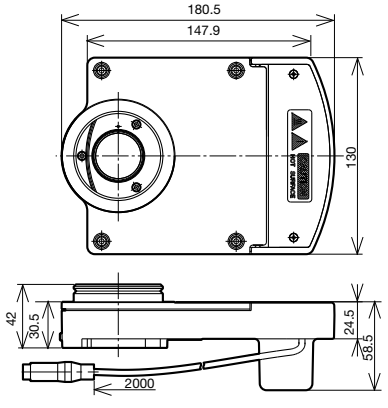
*Consult your local Evident dealer about the motorized focus.

Weight: 2.5 kg

U-FWR

Motorized Reflected Filter Wheel

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



Weight: 1.0 kg

Unit: mm

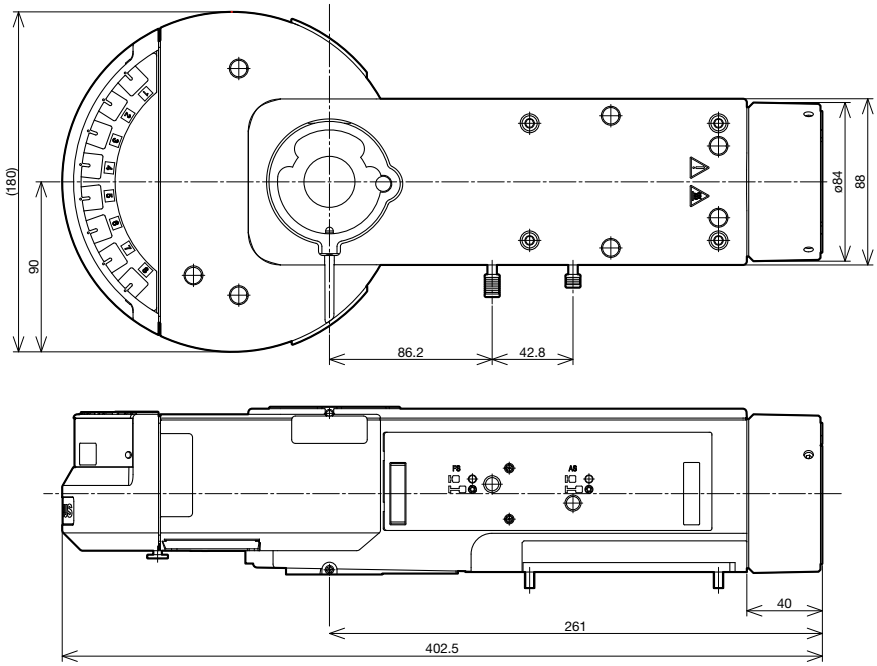
Motorized Units

Motorized Units for the BX3 Series

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

BX3-RFAA

Motorized Fluorescence Illuminator



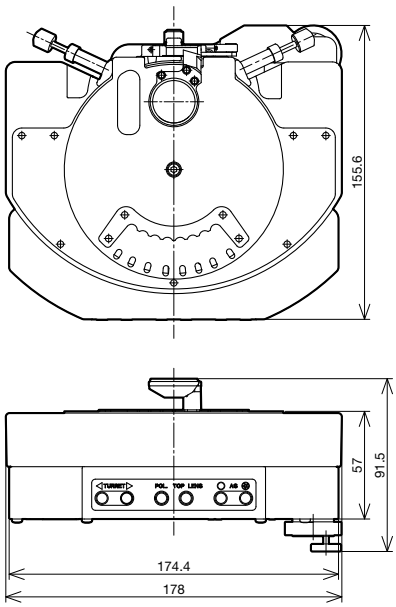
Weight: 4.2 kg

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.

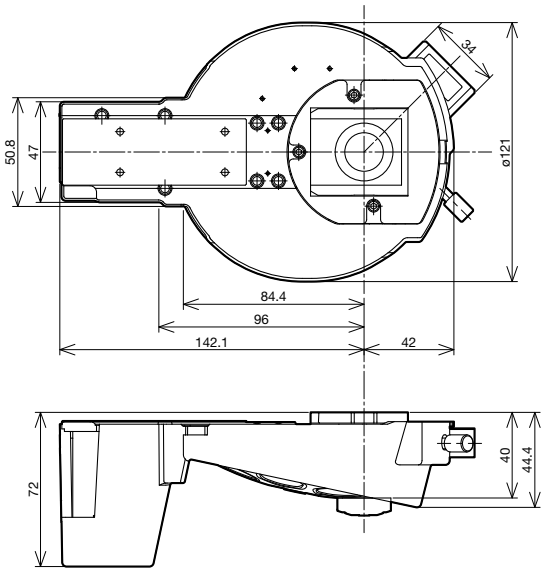
*Optical elements are required. Please consult your local Evident representative about optical elements combinations.



Weight: 1.6 kg

U-D7REA

Motorized Septuple Revolving Nosepiece with Slider Slot for DIC



Weight: 1.5 kg

Unit: mm

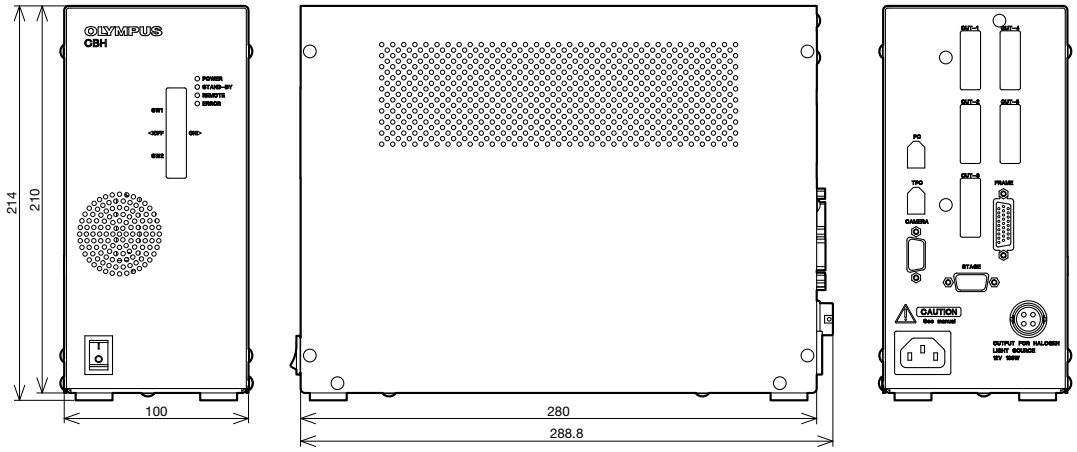
Motorized Units

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.



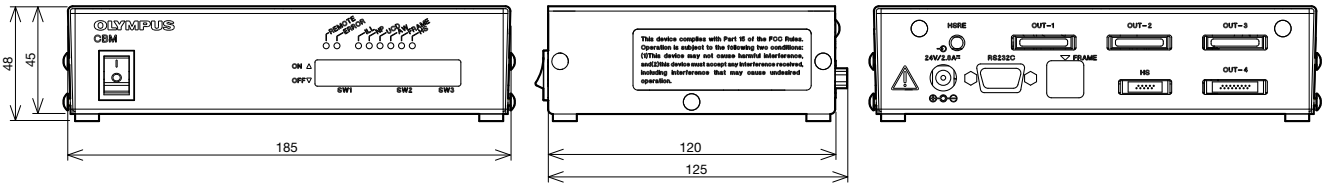
Weight: 4.2 kg

BX3-CBM

Control Box for Motorized Function

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

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



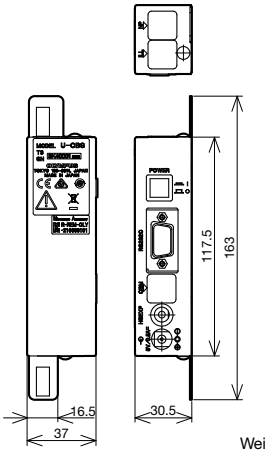
Weight: 0.82 kg

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 Evident 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:

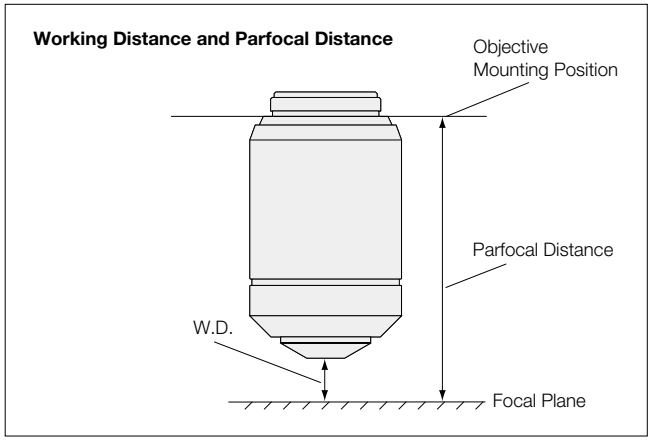
$$FOV = \frac{\text{Eyepiece FN}}{\text{Objective Magnification}} \text{ (mm)}$$

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 Monitor Observation

●Total Magnification for Monitor

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

$M_{(monitor)}$: Total Magnification on the Monitor
$M_{(ob)}$: Objective Magnification
$M_{(camera\ adaptor)}$: Projected magnification for camera adaptor including photo eyepiece
(refer to Figure 1)

**Refer to Figure 3 for "monitor magnification"*

●Practical Field of View for Monitor Observation

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

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

**Refer to Figure 2 for image device size*

Figure 1 Camera Adaptor and Projection Magnifications

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

Figure 2 Imaging Device Size

Camera Format	Diagonal (mm)
1/3 in.	6.0
1/2 in.	8.0
2/3 in.	11.0
1 in.	16.0

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 in.	15 in.	17 in.	19 in.	21"
1/3 in.	42.3X	63.5X	72.0X	80.4X	88.9X
1/2 in.	31.8X	47.6X	54.0X	60.3X	66.7X
2/3 in.	23.1X	34.6X	39.3X	43.9X	48.5X
1 in.	15.9X	23.8X	27.0X	30.1X	33.3X

Example
What is the total magnification of a monitor when a 50X objective, U-TV0.5XC camera adaptor, 2/3 in. camera, and 21 in. monitor are used?

•Total magnification on the monitor:
M(ob) = 50X, M (camera adaptor) is 0.5X from Figure 1, and the monitor magnification is 48.5X from Figure 3.
M(monitor observation) = M(ob) × M(camera adaptor) × monitor magnification = 50 × 0.5 × 48.5 = 1213X

•Practical field of view for observation (horizontal side):
M(ob) = 50X, M(camera adaptor) is 0.5X (from Figure 1), and the horizontal side of a 2/3 in. imaging device is 8.8 mm (from Figure 2)

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

$$= \frac{8.8\ (\text{mm})}{50 \times 0.5} = 352\ \mu\text{m}$$

6. NA

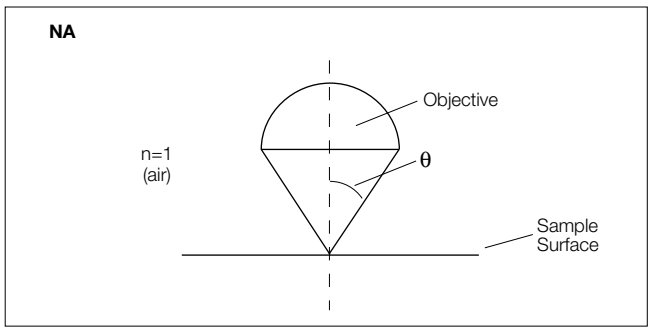
The numerical aperture is a key factor to the performance of an objective (resolving power, depth of field, and brightness). The NA is determined by the following formula:

$$NA = n \times \sin\Theta$$

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 determing resolution.

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

λ: Wavelength or radiation in use
(λ=0.55 μm is used for visible light.)
NA: Objective NA

Example
MPLFLN100X (NA=0.90), λ=0.55 μm

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

8. Depth of field of Microscope

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

Depth of Field Formula

Visual Observation (Berek formula)

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

DOF: Depth of Field

ω: Resolving Power of Eyes 0.0014
(visual angle 5 arc minutes)
M: Total Magnification
(objective magnification x eyepiece magnification)

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

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

Example
With MPLFLN100X (NA=0.90), WHN10X:

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

Camera

In the case of a camera, the depth of field will vary according to the number of pixels of the camera, 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

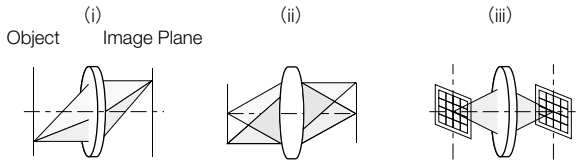
The following three requirements must be satisfied to form an image with no aberrations, or an ideal image.

(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



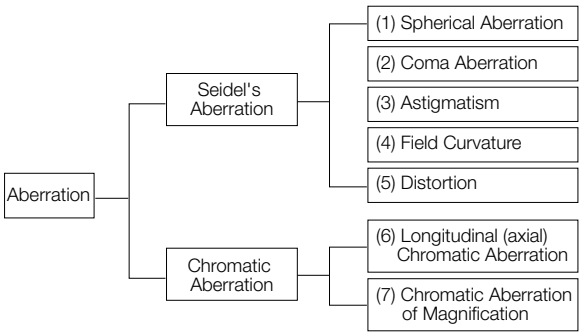
In an actual optical system, however, it is very difficult to strictly meet the requirements for ideal image formation, and this causes aberrations that interfere with image-forming performance.

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.

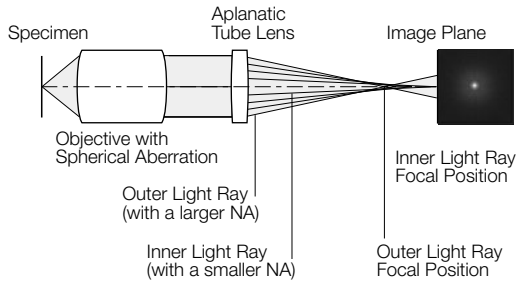
Type (5) corresponds to "deformation" that goes against requirement (iii) in Figure 9-1.

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, which 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

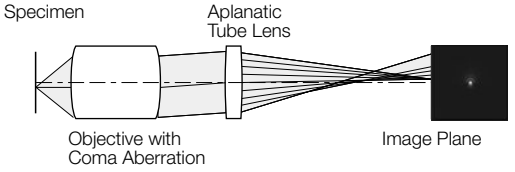


Typically, objectives with a larger NA have better resolution but worse spherical aberration. Our advanced design and manufacturing techniques have realized good optical performance even with a large numerical aperture.

(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.

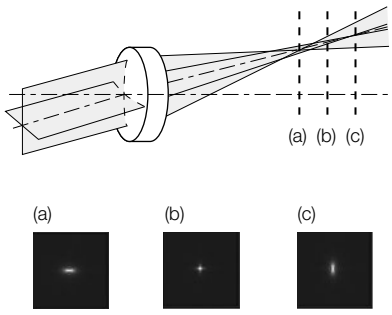
Figure 9-4 Coma Aberration and Spot Shape on the Image Plane



(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.

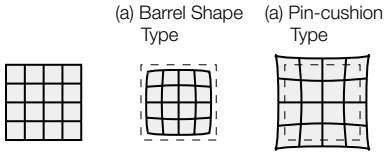
When field curvature is present, the image is more displaced as it becomes closer to the periphery of the visual field. Therefore, when the center of an image is brought into focus, blur occurs in the peripheral areas of the image. To bring the entire image, including the periphery, into clear focus,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

The microscope optical system contains some distortion.

Figure 9-6 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).

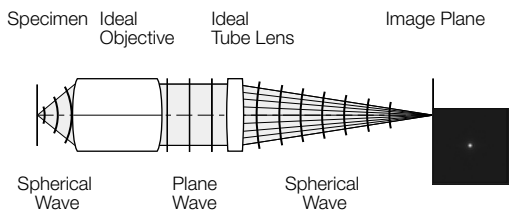
9.3 Wavefront Aberration

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.

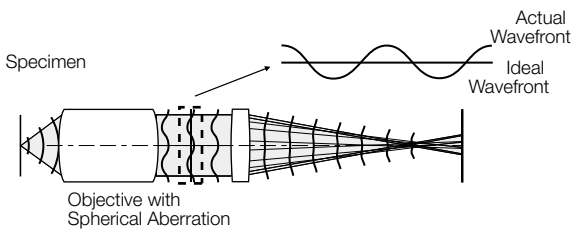
As shown below, when requirements for ideal imaging are satisfied in a microscope optical system, the spherical wavefront (spherical waves) coming from a single point on an object (specimen) is converted to plane waves through an ideal objective. The plane waves are converted to spherical waves through 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

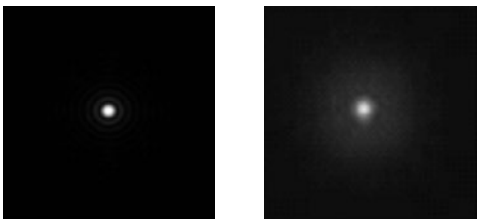


A difference (a degree of disagreement) between the ideal wavefront and the actual wavefront shown above is called wavefront aberration.

9.4 Strehl Ratio

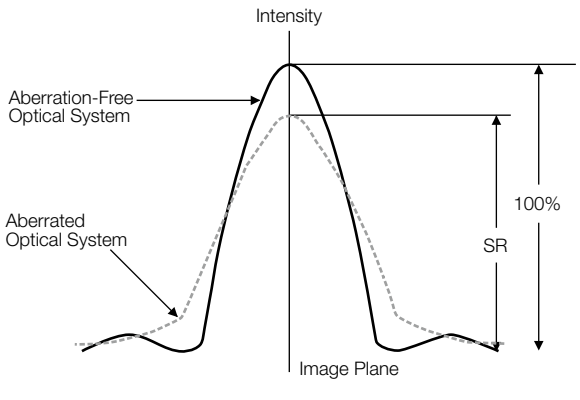
When a point light source is observed with an aberration-free optical system and an aberrated optical system, the former concentrates the focal point to a point at the image formation position. In contrast, the latter fails to produce a focal point, instead causing a spread in the intensity distribution 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).

Memo

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