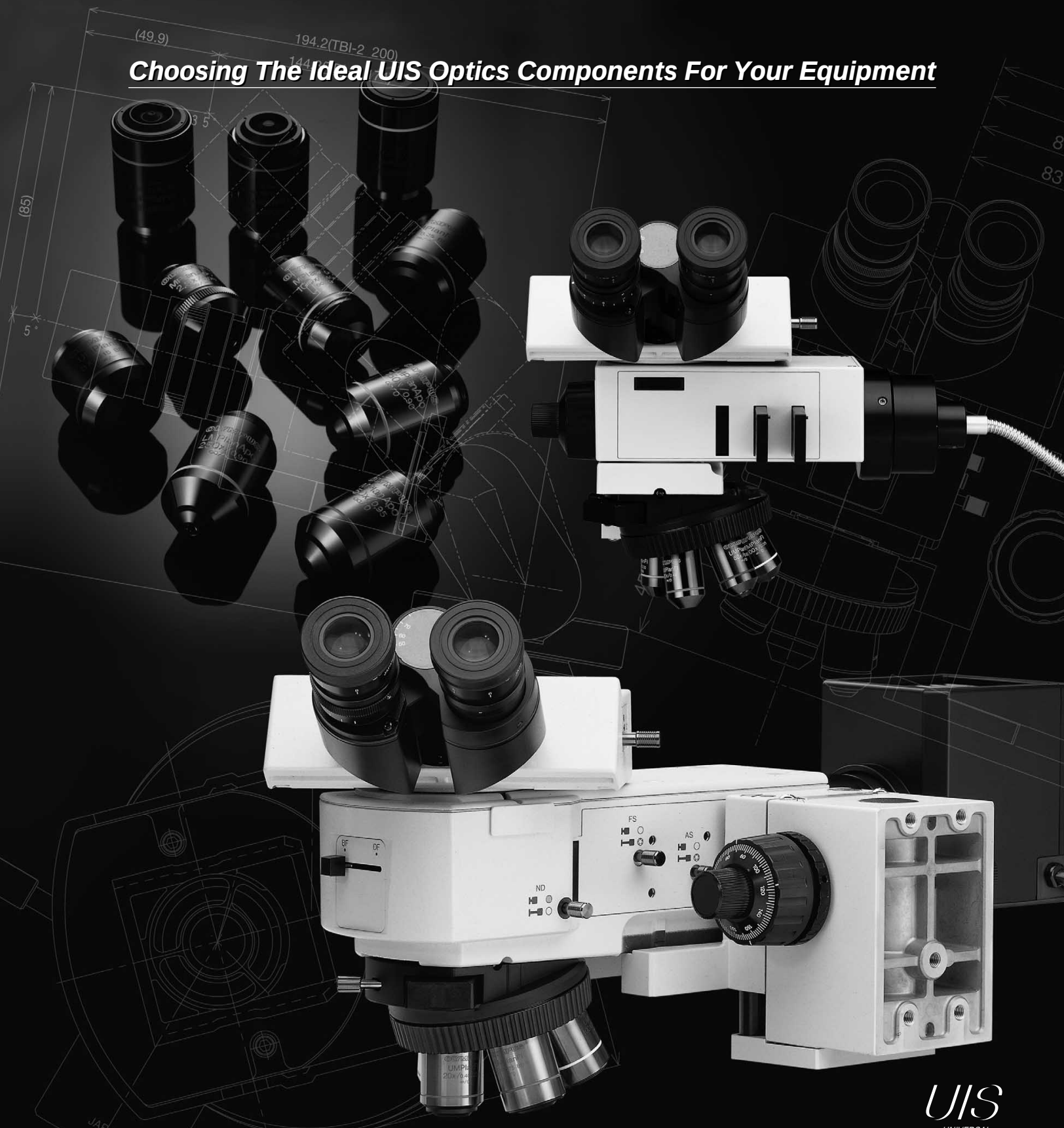
OLYMPUS®

Your Vision, Our Future

MICROSCOPE COMPONENTS GUIDE

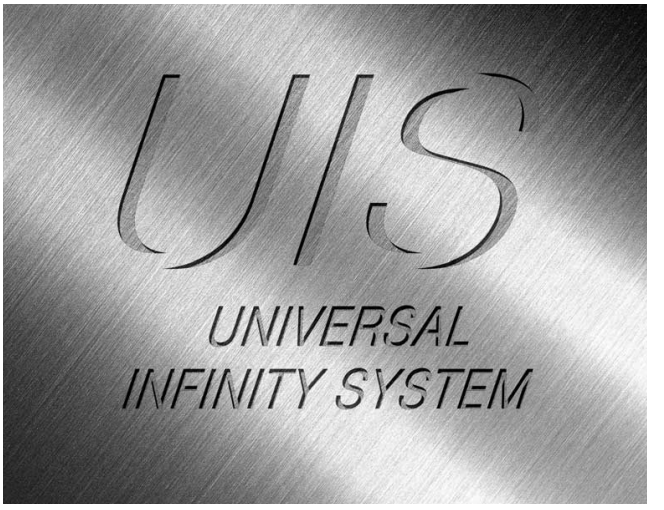
Choosing The Ideal UIS Optics Components For Your Equipment



UIS
UNIVERSAL INFINITY SYSTEM

2005-08

Every microscope user wants the best possible optical system —
one whose quality and flexibility provide
superior performance in a wide variety of applications.
To answer that need in a way that meets
the highly specific requirements of users in
such diverse fields as research, inspection and production,
Olympus presents today's most effective all-round solution:
the UIS Infinity-corrected Optical System.



The wide range of Olympus components introduced here allows
each user to take advantage of the quality,
flexibility and outstanding optical performance of
the UIS Optical System.
That's why installing Olympus microscope components is,
quite simply, the right choice for your equipment.

CONTENTS

Remarks

BX FM/FM-S **Compatible with BXFM/BXFM-S**

BF **Brightfield observation**

BF/DF **Brightfield/darkfield observations**

DIC **DIC* observation**

DIC LM **DIC prism LM position**

DIC UM **DIC prism UM position**

POL **Polarized light observation**

FL **Fluorescence observation**

IR **IR observation**

F.N. 26.5 **Compatible with F.N. 26.5**

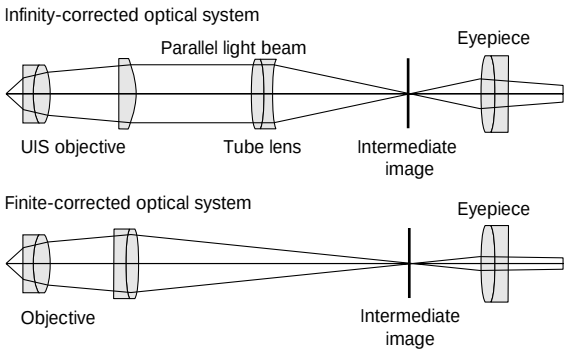
* Differential Interference Contrast

UIS:
The System That Maximizes The Advantage Of Infinity-Corrected Optics

What's UIS Optics?

UIS optics is an infinity-corrected optical system — in other words, a system in which light passes from the specimen through the objective without forming an image along the way. Instead, it travels in the form of infinity parallel rays to the tube lens. The tube lens is where the intermediate image is formed, whereas in finite-corrected optics, this is done by the objective.

Figure 1 Infinity-corrected and finite-corrected optical system principles

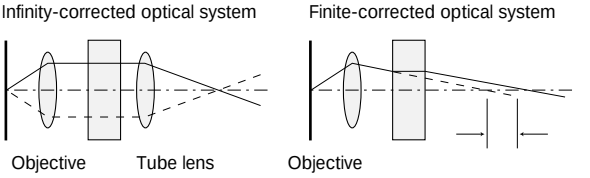


This system, known as "infinity-corrected optics", offers a number of advantages:

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

As thousands of users have found by experience, these advantages are crucial to composing the ideal microscope optical system. What's more, it is even possible to freely insert or remove intermediate attachments in the parallel rays of light between the objective and tube lens, allowing the creation of user-specific or task-specific optical systems. To establish real flexibility with such a system, it is necessary to eliminate the occurrence of coma aberration.

Figure 2 Advantages of Infinity-corrected optical system

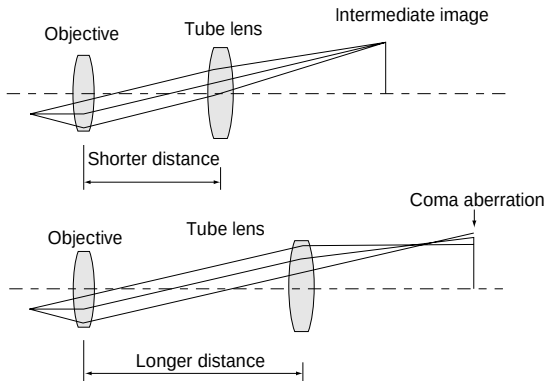


Since conventional infinity-corrected optical systems do not solve the problems of coma aberration, they are incomplete in the system expandability.

Why is coma aberration more pronounced when the distance between the objective and the tube lens increases?

The reason is shown in Figure 3.
As the distance increases, the more rays of light pass through the peripheral areas of the tube lens. The tube lens is convex in the conventional optical systems, so rays of light passing through its peripheral areas are subjected to stronger refraction power, causing comma. Comma aberration has to be eliminated in order to achieve good image forming. Conventional infinity optical systems have single element tube lenses. The system flexibility to insert intermediate attachment is therefore restricted.

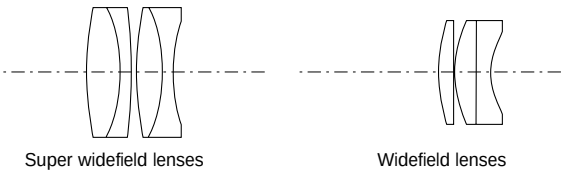
Figure 3 Conventional infinity-corrected optical system



UIS Optics solve the problem of coma aberration by using a new, Olympus-developed tube lens

The new Olympus lens, by contrast, combines several convex and concave lenses together — balancing the positive refraction power of each convex lens with the negative refraction power of each concave lens. This balance minimizes the coma aberration, and even when the distance between the objective and tube lens is varied, provides sufficient compensation to maintain image forming performance. The tube lenses consist of 2 group/4 element compound structure corresponding to super widefield (F.N. 26.5) and 2 group/3 element compound structure corresponding to widefield (F.N. 22).

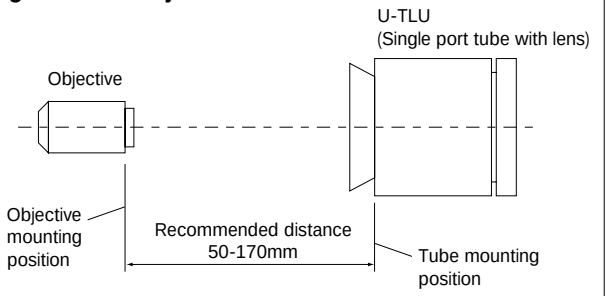
Figure 4 Newly developed tube lens



Another problem caused by changes of distance between the objective and the tube lens is that the exit pupil position of the tube lens changes as well, disrupting the flatness of the image when observed through the eyepiece.

One of our solutions is to develop a new eyepiece, capable of independently compensating for the aberration and maintaining image flatness even when distances between the objective and the tube lens are changed. All these newly developed lenses and systems are patented.
(U.S. patent No. 5394271)

Figure 5 UIS objectives



* Recommended distance between objective and U-TLU (single port tube with lens) is 50-170 mm.
* When combining with our incident light illuminator, the distance from the objective mounting position to the illumination tube lower mounting position should be 60mm.
If this distance is changed, illumination performance cannot be maintained.

Based on our conviction that the UIS system is the best way to maximize the advantages of infinity-corrected optical systems, we confidently recommend the UIS-featured Olympus microscope units for all your high-precision needs in research, inspection and production equipment.

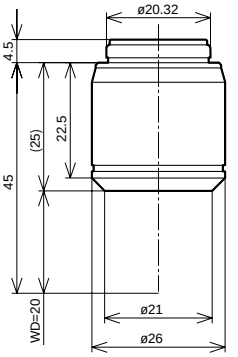
Universal objectives

UMPlanFL series

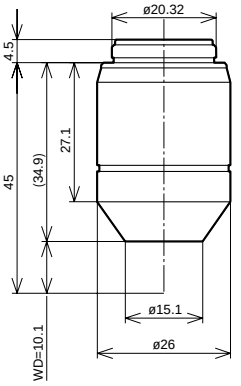
BX FM/FM-S BF DIC UM POL FL F.N. 26.5

Plan Semi-Apochromat objectives, giving high-level correction for chromatic aberration.

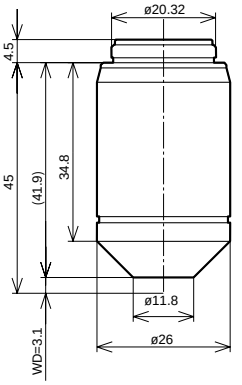
UMPLFL5X



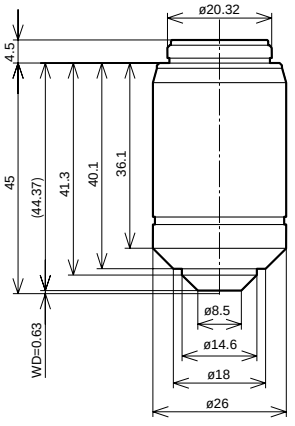
UMPLFL10X



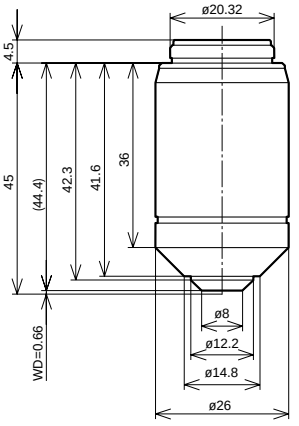
UMPLFL20X



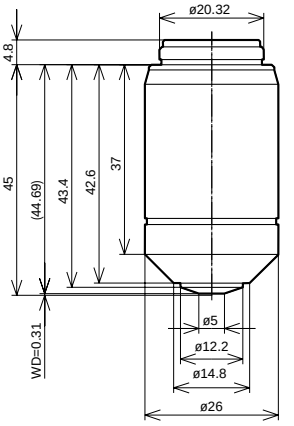
UMPLFL40X



UMPLFL50X



UMPLFL100X



Unit: mm

UIS objectives						Widefield UIS eyepiece WHN10× Field Number 22			Super widefield UIS eyepiece SWH10× Field Number 26.5		
Objective (magnification)	Numerical Aperture	Working distance (mm)	Focal distance f (mm)	Depth of focus on specimen plane in microphotography (µm)	Weight (g)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)
UMPLFL 5X	0.15	20.0	36.0	12.22	70	50	4.4	59	50	5.3	59
UMPLFL 10X	0.30	10.1	18.0	3.06	90	100	2.2	15	100	2.7	15
UMPLFL 20X	0.46	3.1	9.00	1.30	110	200	1.1	5.1	200	1.3	5.1
UMPLFL 40X	0.75	0.63	4.50	0.49	125	400	0.55	1.7	400	0.66	1.7
UMPLFL 50X	0.80	0.66	3.60	0.43	115	500	0.44	1.3	500	0.53	1.3
UMPLFL 100X	0.95	0.31	1.80	0.30	140	1,000	0.22	0.73	1,000	0.27	0.73

Screw: W20.32X0.706 (0.8"X1/36")

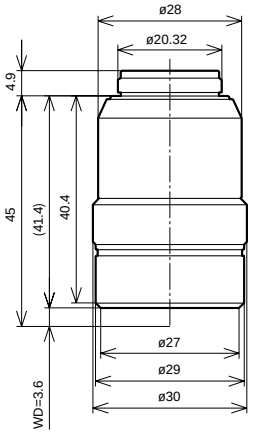
High resolution objectives

MPlanApo series

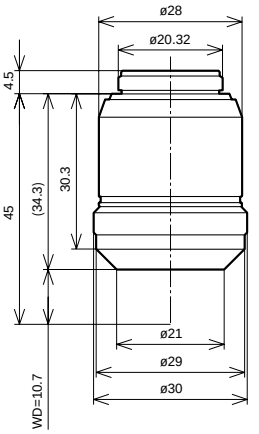
BX FM/FM-S BF DIC UM *1 POL F.N. 26.5 *2

Highest class Plan Apochromat objectives that maximize performance in brightfield observation.
All aberrations are corrected at the highest level, while providing high N.A.

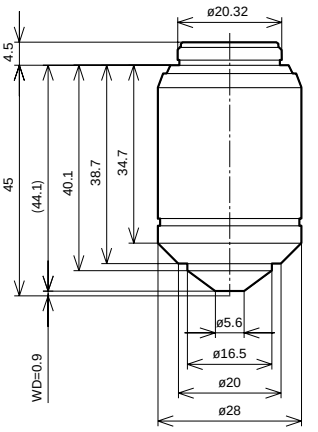
MPLAPO1.25X*2



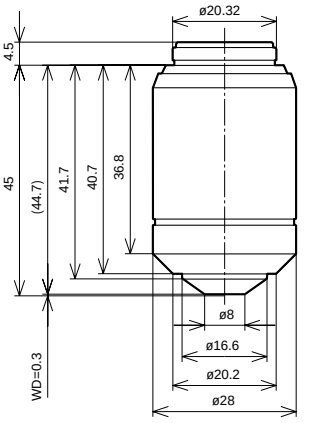
MPLAPO2.5X*3



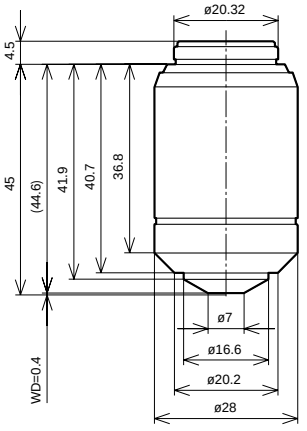
MPLAPO20X



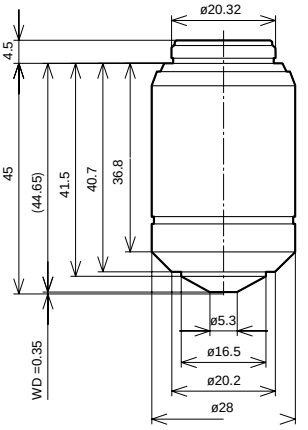
MPLAPO50X



MPLAPO60X



MPLAPO100X



Unit: mm

UIS objectives						Widefield UIS eyepiece WHN10× Field Number 22			Super widefield UIS eyepiece SWH10× Field Number 26.5		
Objective (magnification)	Numerical Aperture	Working distance (mm)	Focal distance f (mm)	Depth of focus on specimen plane in microphotography (µm)	Weight (g)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)
MPLAPO 1.25X *3	0.04	3.6	145.1	171.88	160	12.5	17.6	870	—	—	—
MPLAPO 2.5X *3	0.08	10.7	72.0	42.97	140	25	8.8	220	25	10.6	220
MPLAPO 20X	0.60	0.90	9.0	0.76	150	200	1.1	3.7	200	1.3	3.7
MPLAPO 50X	0.95	0.30	3.60	0.30	150	500	0.44	1.0	500	0.53	1.0
MPLAPO 60X	0.90	0.40	3.00	0.34	148	600	0.36	1.0	600	0.44	1.0
MPLAPO 100X	0.95	0.35	1.80	0.30	150	1,000	0.22	0.67	1,000	0.27	0.67

Screw: W20.32X0.706 (0.8"X1/36")

*1 Available in 20X and 100X objectives only. *2 It is all applied except MPlanApo1.25X.
*3 Analyzer(U-AN or U-AN360) and polarizer(U-PO) are needed in use.

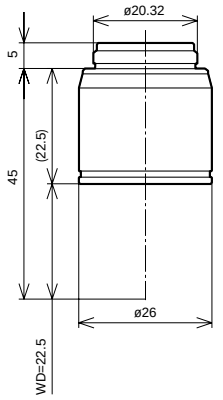
Long working distance objectives

LMPlanFL series

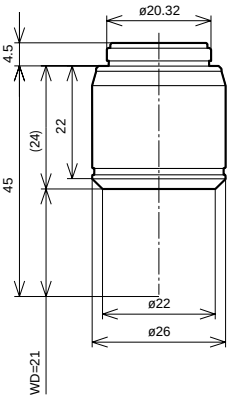
Plan Semi-Apochromat objectives with long working distance.

BX FM/FM-S BF DIC LM POL F.N. 26.5

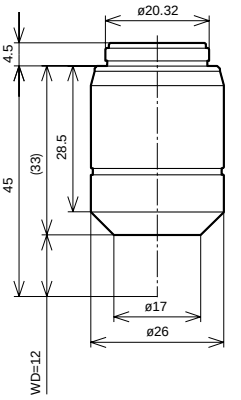
LMPLFL5X



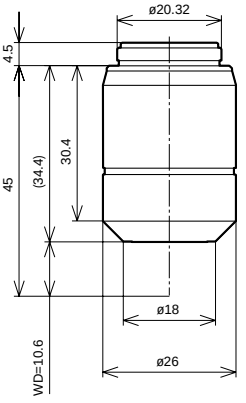
LMPLFL10X



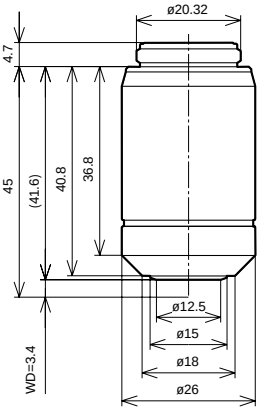
LMPLFL20X



LMPLFL50X



LMPLFL100X



Unit: mm

UIS objectives						Widefield UIS eyepiece WHN10× Field Number 22			Super widefield UIS eyepiece SWH10× Field Number 26.5		
Objective (magnification)	Numerical Aperture	Working distance (mm)	Focal distance f (mm)	Depth of focus on specimen plane in microphotography (µm)	Weight (g)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)
LMPLFL 5X	0.13	22.5	36.00	16.27	64	50	4.4	70	50	5.3	70
LMPLFL 10X	0.25	21.0	18.00	4.40	112	100	2.2	18	100	2.7	18
LMPLFL 20X	0.40	12.0	9.00	1.72	100	200	1.1	6.1	200	1.3	6.1
LMPLFL 50X	0.50	10.6	3.60	1.10	105	500	0.44	2.5	500	0.53	2.5
LMPLFL 100X	0.80	3.4	1.80	0.43	120	1,000	0.22	0.87	1,000	0.27	0.87

Screw: W20.32X0.706 (0.8"X1/36")

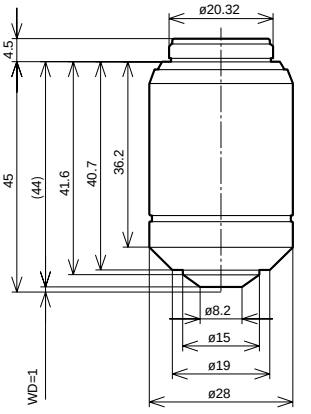
Ultra high magnification objectives

LMPlanApo series

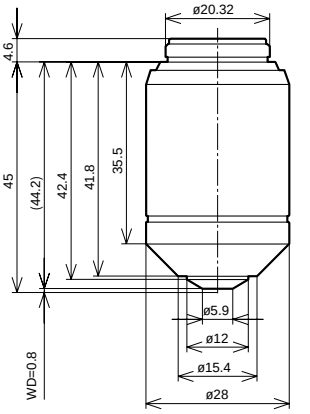
Plan Apochromat objectives with ultra high magnification and long working distance.

BX FM/FM-S BF DIC LM POL F.N. 26.5

LMPLAPO150X



LMPLAPO250X



Unit: mm

UIS objectives						Widefield UIS eyepiece WHN10× Field Number 22			Super widefield UIS eyepiece SWH10× Field Number 26.5		
Objective (magnification)	Numerical Aperture	Working distance (mm)	Focal distance f (mm)	Depth of focus on specimen plane in microphotography	Weight (g)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)
LMPLAPO 150X	0.90	1.0	1.20	0.34	140	1,500	0.15	0.60	1,500	0.18	0.60
LMPLAPO 250X	0.90	0.80	0.72	0.34	135	2,500	0.09	0.50	2,500	0.1	0.50

Screw: W20.32X0.706 (0.8"X1/36")

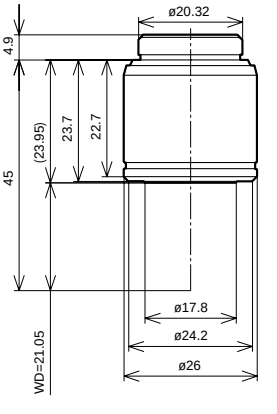
Ultra long working distance objectives

SLMPlan series

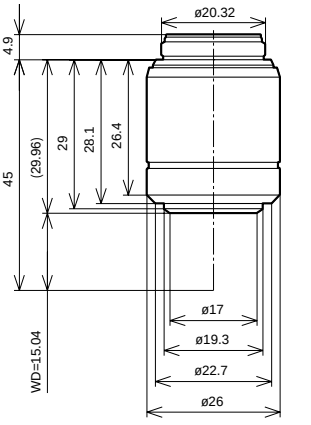
Plan Achromat objectives with high magnifications and ultra long working distance.

BX FM/FM-S BF POL F.N. 26.5

SLMPL20X



SLMPL50X



Unit: mm

UIS objectives						Widefield UIS eyepiece WHN10× Field Number 22			Super widefield UIS eyepiece SWH10× Field Number 26.5		
Objective (magnification)	Numerical Aperture	Working distance (mm)	Focal distance f (mm)	Depth of focus on specimen plane in microphotography (µm)	Weight (g)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)
SLMPL 20X	0.35	21.0	9.00	2.24	73	200	1.1	7.2	200	1.3	7.2
SLMPL 50X	0.45	15.0	3.60	1.36	91	500	0.44	2.9	500	0.53	2.9

Screw: W20.32X0.706 (0.8"X1/36")

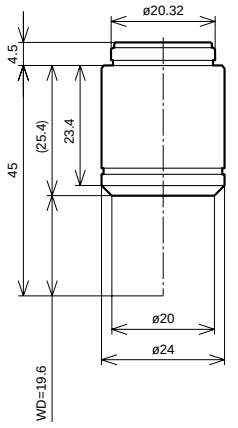
Brightfield objectives

MPlan series

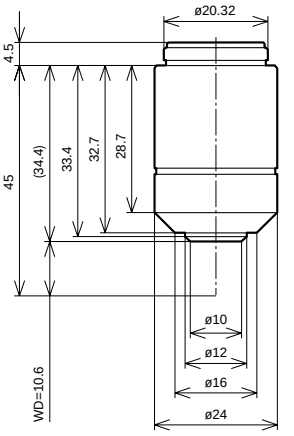
BX FM/FM-S BF

Plan Achromat objectives providing excellent image flatness up to F.N. 22.

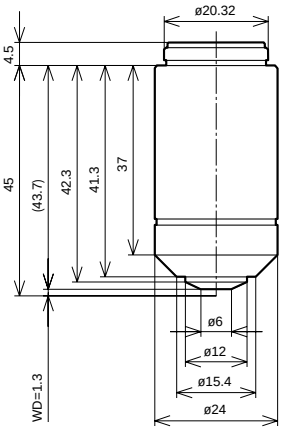
MPL5X



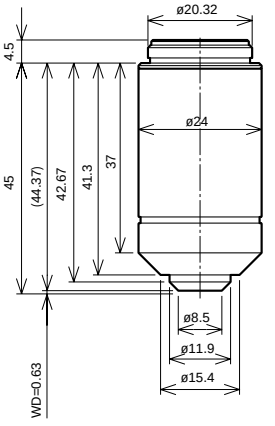
MPL10X



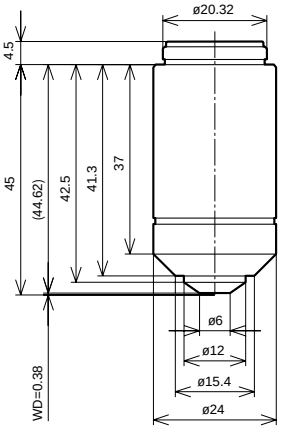
MPL20X



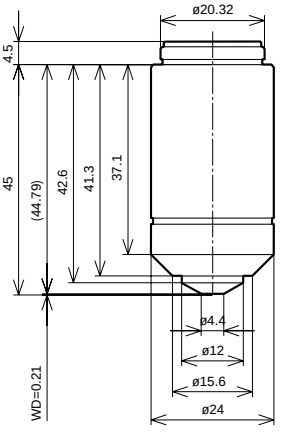
MPL40X



MPL50X



MPL100X



Unit: mm

UIS objectives						Widefield UIS eyepiece WHN10× Field Number 22		
Objective (magnification)	Numerical Aperture	Working distance (mm)	Focal distance f (mm)	Depth of focus on specimen plane in microphotography (µm)	Weight (g)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)
MPL 5X	0.10	19.6	36.00	27.5	90	50	4.4	98
MPL 10X	0.25	10.6	18.00	4.40	80	100	2.2	18
MPL 20X	0.40	1.3	9.00	1.72	110	200	1.1	6.1
MPL 40X	0.65	0.63	4.5	0.65	120	400	0.55	2
MPL 50X	0.75	0.38	3.60	0.49	115	500	0.44	1.4
MPL 100X	0.90	0.21	1.80	0.34	110	1,000	0.22	0.73

Screw: W20.32X0.706(0.8"X1/36")

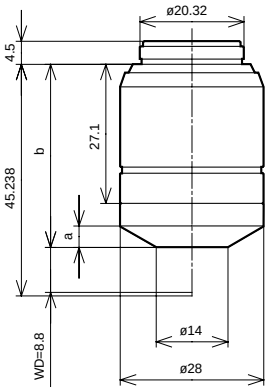
LCD inspection objectives

LCPlanApo/LCPlanFL-LCD series

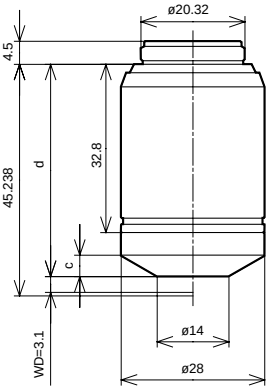
Ideal for sample observations through glass substrate such as FPD (Flat Panel Display).

BX FM/FM-S BF DIC LM POL F.N. 26.5

LCPLAPO20X



LCPLAPO50X



Glass thickness (mm)	LCPLAPO20X		LCPLAPO50X	
	a	b	c	d
0	9.3	36.463	9.3	42.163
0.7	8.6	35.763	8.6	41.463
1.1	8.2	35.363	8.2	41.063

	Compatible glass thickness (mm)	Correction method
LCPLAPO20X LCPLAPO50X	0 0.7 1.1	Correction cap

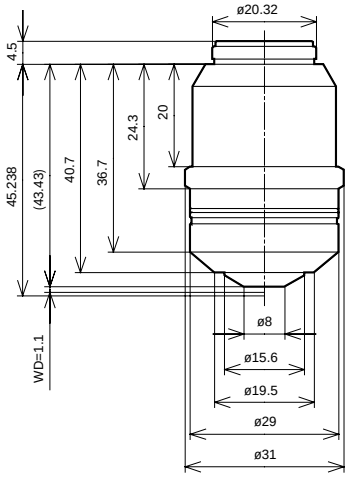
Note 1.
LCPLAPO20X and 50X compensate up to 3mm thick glass. However, special correction caps are required for glass thickness not stated on the above chart.
Note 2.
There are no W.D. difference among 3 types of caps.

Unit: mm

UIS objectives						Widefield UIS eyepiece WHN10× Field Number 22			Super widefield UIS eyepiece SWH10× Field Number 26.5		
Objective (magnification)	Numerical Aperture	Working distance (mm)	Focal distance f (mm)	Depth of focus on specimen plane in microphotography (µm)	Weight (g)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)
LCPLAPO 20X	0.40	8.8	9.00	1.72	116.5	200	1.1	6.1	200	1.3	6.1
LCPLAPO 50X	0.60	3.1	3.60	0.76	142.5	500	0.44	1.9	500	0.53	1.9

Screw: W20.32X0.706 (0.8"X1/36")

LCPLFL100XLCD



* In LCPLFL100X-LCD, compensation is accomplished via the correction ring according to glass thickness and variations in working distance (W.D.), as shown in the following separate chart.

Range of compatible glass thickness (mm)	Indication value of correction ring	Working distance (mm)	Correction method
0.6 - 1.2	0.6	1.143	Correction ring
	0.7	1.1	
	1.2	0.95	

Unit: mm

UIS objectives						Widefield UIS eyepiece WHN10× Field Number 22			Super widefield UIS eyepiece SWH10× Field Number 26.5		
Objective (magnification)	Numerical Aperture	Working distance (mm)	Focal distance f (mm)	Depth of focus on specimen plane in microphotography (µm)	Weight (g)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)
LCPLFL 100X-LCD	0.80	1.1*	1.8	0.43	160	1,000	0.22	0.87	1,000	0.27	0.87

Screw: W20.32X0.706 (0.8"X1/36")

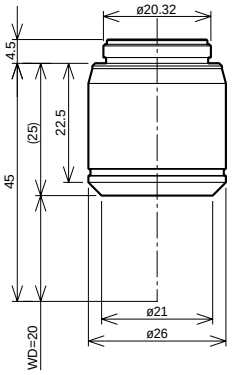
IR objectives

LMPlan-IR series/MPlan-IR

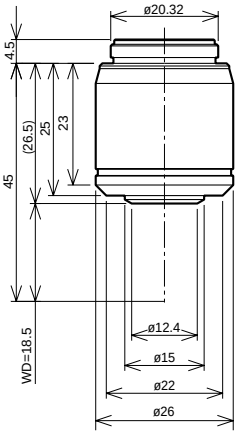
BX FM/FM-S BF IR

IR objectives which compensate for aberrations from visible to near infrared light.
Ideal for the observations of semiconductor interiors and the back surface of a chip package as well as CSP bump inspection.

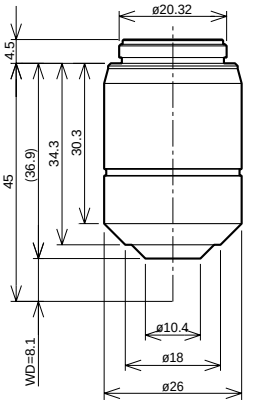
LMPL5XIR



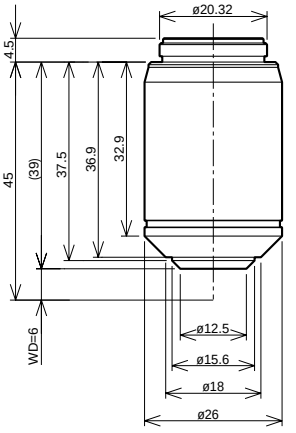
LMPL10XIR



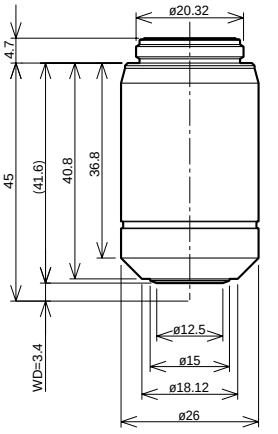
LMPL20XIR



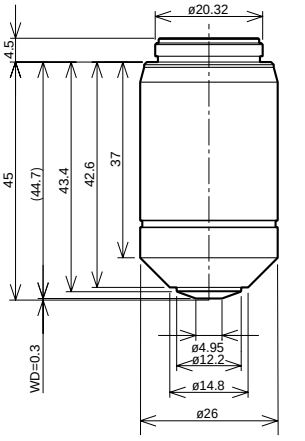
LMPL50XIR



LMPL100XIR



MPL100XIR



Unit: mm

UIS objectives						Widefield UIS eyepiece WHN10× Field Number 22		
Objective (magnification)	Numerical Aperture	Working distance (mm)	Focal distance f (mm)	Depth of focus on specimen plane in microphotography (µm)*	Weight (g)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)
LMPL 5XIR	0.10	20.0	36.00	27.5	73	50	4.4	98
LMPL 10XIR	0.25	18.5	18.00	4.40	73	100	2.2	18
LMPL 20XIR	0.40	8.1	9.00	1.72	110	200	1.1	6.1
LMPL 50XIR	0.55	6.0	3.60	0.91	115	500	0.44	2.2
LMPL 100XIR	0.80	3.4	1.80	0.43	122	1,000	0.22	0.87
MPL 100XIR	0.95	0.3	1.80	0.30	130	1,000	0.22	0.67

Screw: W20.32X0.706(0.8"X1/36")

* Calculated value at 550nm

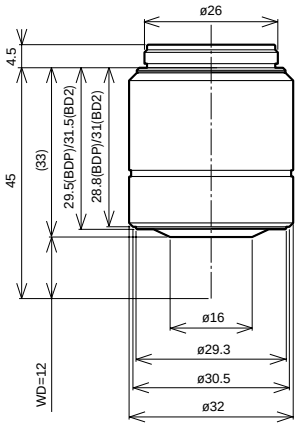
Universal objectives

UMPlanFL-BD series /-BDP series

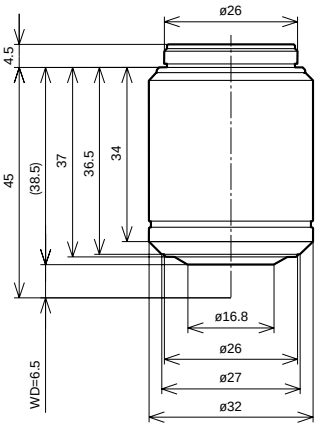
BX FM/FM-S BF/DF DIC UM POL FL F.N. 26.5

Plan Semi-Apochromat objectives giving high-level correction for chromatic aberration.
The UMPlanFL-BDP series provides the best performance, especially in DIC observations.

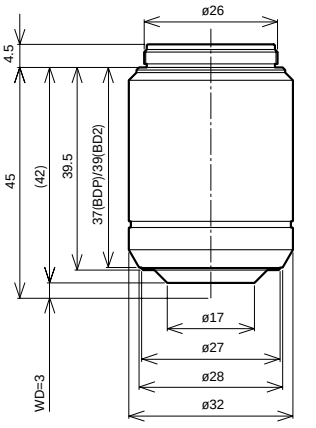
UMPLFL5XBD2
UMPLFL5XBDP



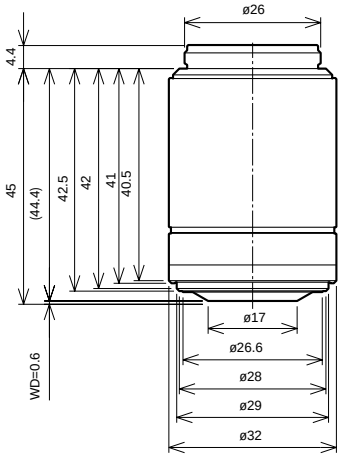
UMPLFL10XBD2
UMPLFL10XBDP



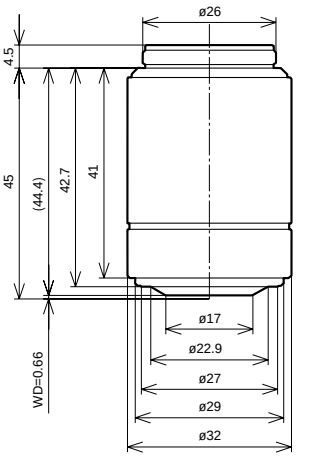
UMPLFL20XBD2
UMPLFL20XBDP



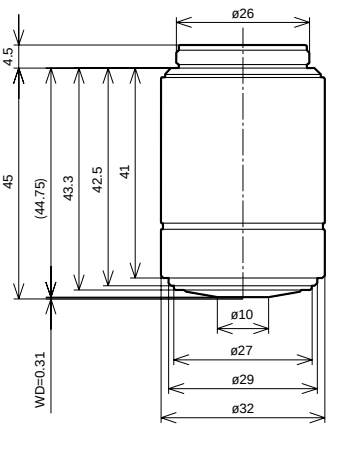
UMPLFL40XBDP



UMPLFL100XBD
UMPLFL100XBDP



UMPLFL100XBD
UMPLFL100XBDP



Unit: mm

UIS objectives							Widefield UIS eyepiece WHN10× Field Number 22			Super widefield UIS eyepiece SWH10× Field Number 26.5		
Objective (magnification)	Numerical Aperture	Working distance (mm)	Focal distance f (mm)	Depth of focus on specimen plane in microphotography (µm)	Weight (g)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)
UMPLFL 5XBD2	0.15	12.0	36.0	12.22	120	50	4.4	59	50	5.3	59
UMPLFL 10XBD2	0.30	6.5	18.0	3.06	160	100	2.2	15	100	2.7	15
UMPLFL 20XBD2	0.46	3.0	9.00	1.30	150	200	1.1	5.1	200	1.3	5.1
UMPLFL 50XBD	0.80	0.66	3.60	0.43	160	500	0.44	1.3	500	0.53	1.3
UMPLFL 100XBD	0.90	0.31	1.80	0.34	180	1,000	0.22	0.73	1,000	0.27	0.73
UMPLFL 5XBDP	0.15	12.0	36.0	12.22	120	50	4.4	59	50	5.3	59
UMPLFL 10XBDP	0.25	6.5	18.0	4.40	160	100	2.2	18	100	2.7	18
UMPLFL 20XBDP	0.40	3.0	9.00	1.72	150	200	1.1	6.1	200	1.3	6.1
UMPLFL 40XBDP	0.75	0.6	4.5	0.49	160	400	0.55	1.7	400	0.66	1.7
UMPLFL 50XBDP	0.75	0.66	3.60	0.49	160	500	0.44	1.4	500	0.53	1.4
UMPLFL 100XBDP	0.90	0.31	1.80	0.34	180	1,000	0.22	0.73	1,000	0.27	0.73

Screw: W26X0.706

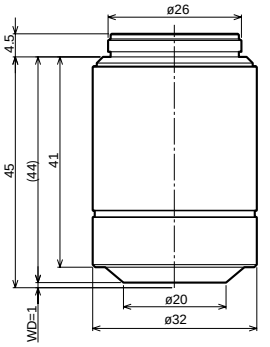
Long working distance universal objectives

MPlanFL50XBD2, MPlanFL100XBD2

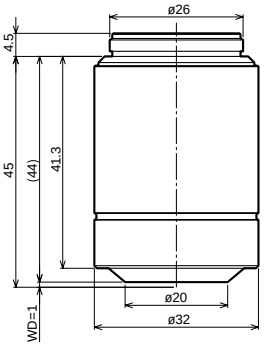
Plan Semi-Apochromat objectives with long working distance (1mm) while providing high N.A.

BX FM/FM-S BF/DF DIC UM POL F.N. 26.5

MPLFL50XBD2



MPLFL100XBD2



Unit: mm

UIS objectives							Widefield UIS eyepiece WHN10× Field Number 22			Super widefield UIS eyepiece SWH10× Field Number 26.5		
Objective (magnification)	Numerical Aperture	Working distance (mm)	Focal distance f (mm)	Depth of focus on specimen plane in microphotography (µm)	Weight (g)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)
UMPLFL 50XBD2	0.80	1.0	3.60	0.43	170	500	0.44	1.3	500	0.53	1.3
UMPLFL 100XBD2	0.90	1.0	1.80	0.34	180	1,000	0.22	0.73	1,000	0.27	0.73

Screw: W20.32X0.706 (0.8"X1/36")

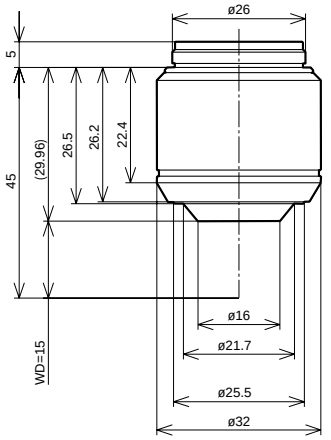
Long working distance objectives

LMPlanFL-BD series

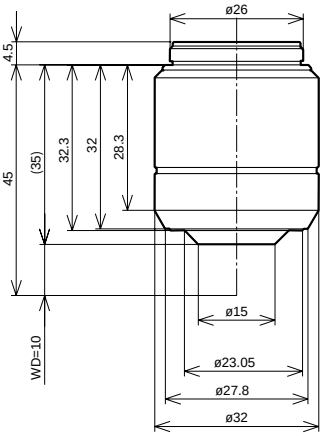
BX FM/FM-S BF/DF DIC LM POL F.N. 26.5

Plan Semi-Apochromat objectives with long working distance.

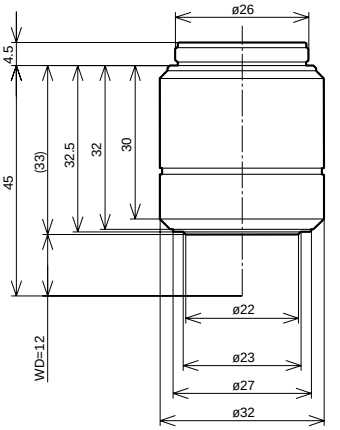
LMPLFL5XBD



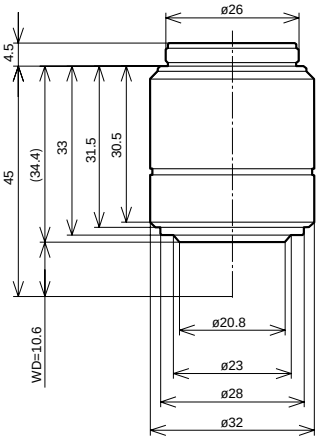
LMPLFL10XBD



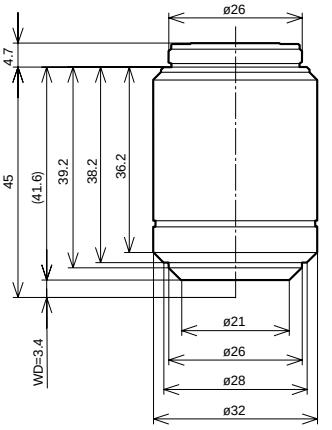
LMPLFL20XBD



LMPLFL50XBD



LMPLFL100XBD



Unit: mm

UIS objectives							Widefield UIS eyepiece WHN10× Field Number 22			Super widefield UIS eyepiece SWH10× Field Number 26.5		
Objective (magnification)	Numerical Aperture	Working distance (mm)	Focal distance f (mm)	Depth of focus on specimen plane in microphotography (µm)	Weight (g)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)
LMPLFL 5XBD	0.13	15.0	36.00	16.27	70	50	4.4	70	50	5.3	70
LMPLFL 10XBD	0.25	10.0	18.00	4.40	132	100	2.2	18	100	2.7	18
LMPLFL 20XBD	0.40	12.0	9.00	1.72	145	200	1.1	6.1	200	1.3	6.1
LMPLFL 50XBD	0.50	10.6	3.60	1.10	150	500	0.44	2.5	500	0.53	2.5
LMPLFL 100XBD	0.80	3.4	1.80	0.43	185	1,000	0.22	0.87	1,000	0.27	0.87

Screw: W26X0.706

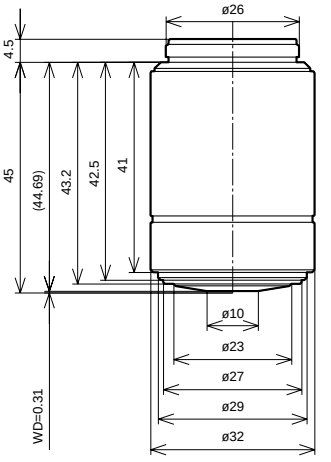
High resolution objective

MPlanApo-BD

BX FM/FM-S BF/DF DIC UM POL F.N. 26.5

Highest class Plan Apochromat objective that maximize performance in brightfield and darkfield observations. All aberrations are corrected at the highest level.

MPLAPO100X



Unit: mm

UIS objectives						Widefield UIS eyepiece WHN10× Field Number 22			Super widefield UIS eyepiece SWH10× Field Number 26.5		
Objective (magnification)	Numerical Aperture	Working distance (mm)	Focal distance f (mm)	Depth of focus on specimen plane in microphotography (µm)	Weight (g)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)
MPLAPO 100XBD	0.9	0.31	1.8	0.34	180	1,000	0.22	0.59	1,000	0.27	0.59

Screw: W26X0.706

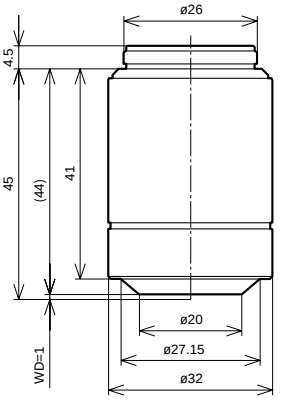
Ultra high magnification objectives

LMPlanApo-BD series

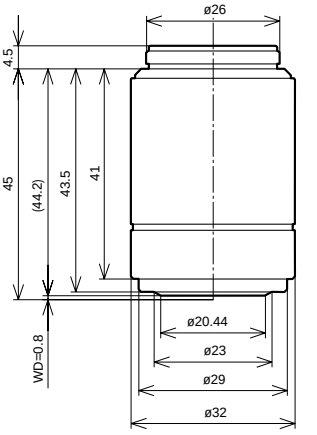
BX FM/FM-S BF/DF DIC LM POL F.N. 26.5

Plan Apochromat objectives with ultra high magnification and long working distance.

LMPLAPO150XBD



LMPLAPO250×BD



Unit: mm

UIS objectives						Widefield UIS eyepiece WHN10× Field Number 22			Super widefield UIS eyepiece SWH10× Field Number 26.5		
Objective (magnification)	Numerical Aperture	Working distance (mm)	Focal distance f (mm)	Depth of focus on specimen plane in microphotography (µm)	Weight (g)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)
LMPLAPO 150XBD	0.90	1.0	1.20	0.34	178	1,500	0.15	0.60	1,500	0.18	0.60
LMPLAPO 250XBD	0.90	0.80	0.72	0.34	170	2,500	0.09	0.50	2,500	0.11	0.50

Screw: W26X0.706

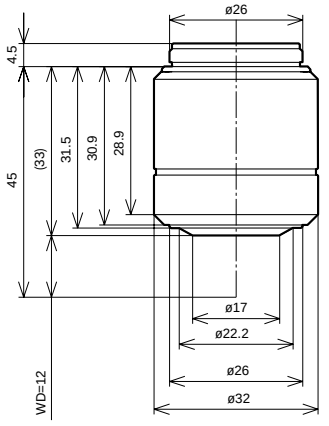
Brightfield/darkfield objectives

MPlan-BD series

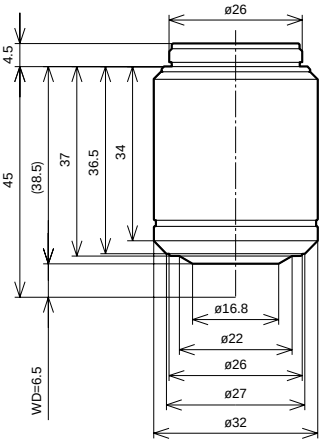
BX FM/FM-S BF/DF

Plan Achromat objectives providing excellent image flatness up to F.N.22.

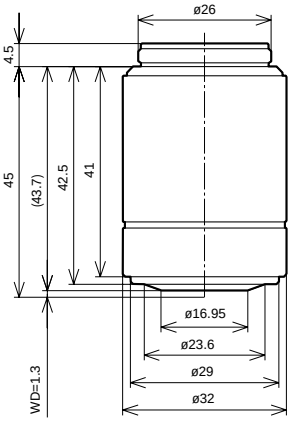
MPL5XBD



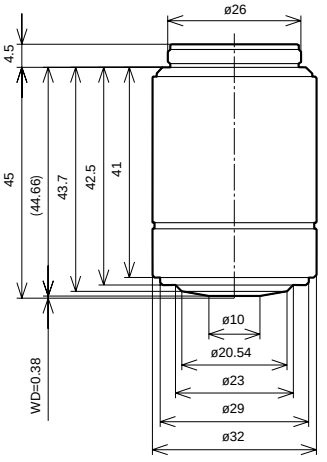
MPL10XBD



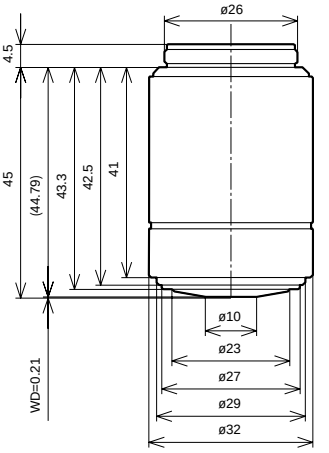
MPL20XBD



MPL50XBD



MPL100XBD



Unit: mm

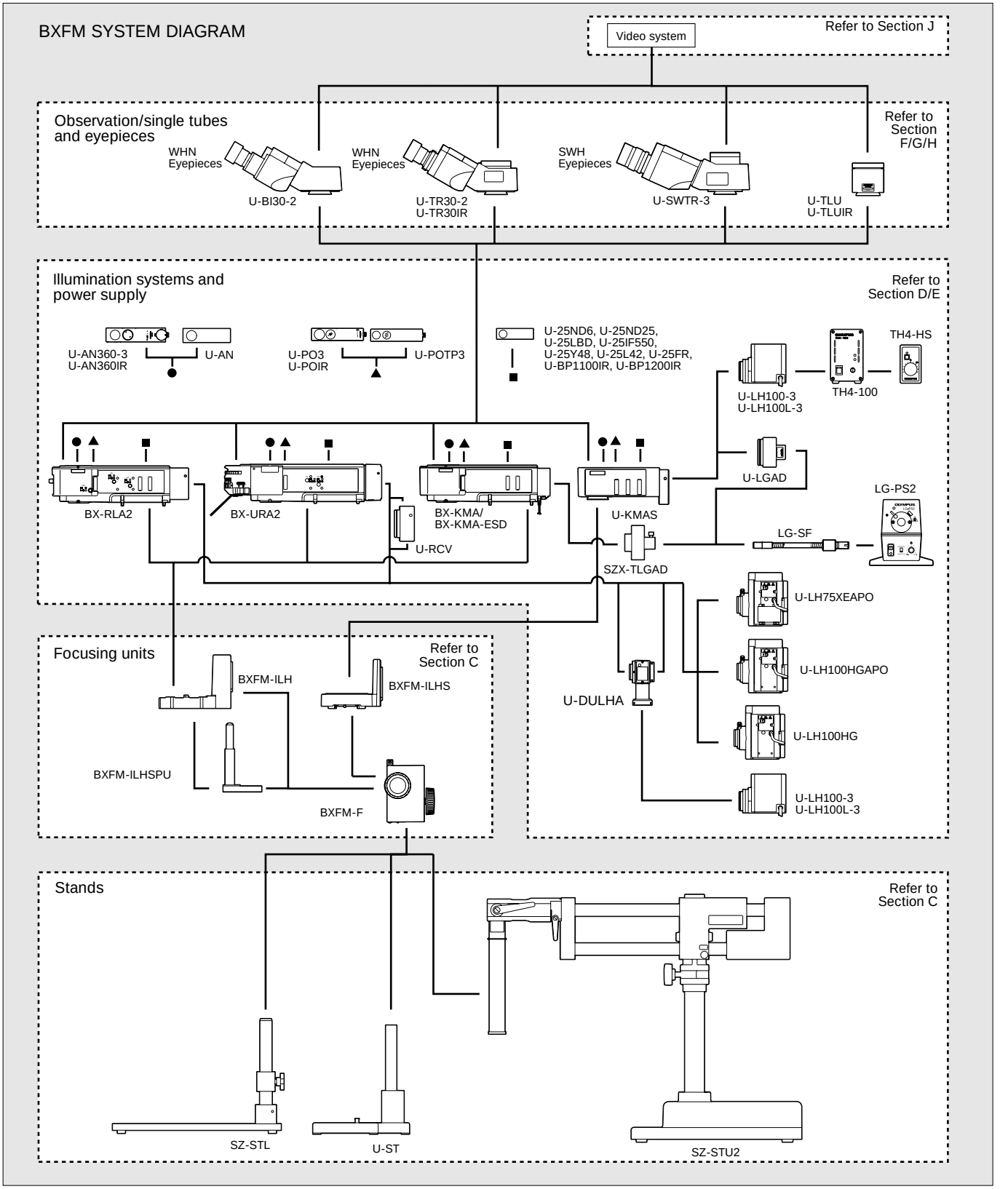
UIS objectives						Widefield UIS eyepiece WHN10× Field Number 22		
Objective (magnification)	Numerical Aperture	Working distance (mm)	Focal distance f (mm)	Depth of focus on specimen plane in microphotography (µm)	Weight (g)	Total magnifications	Practical field of view (mm)	Depth of focus (µm)
MPL 5XBD	0.10	12.0	36.00	27.5	130	50	4.4	98
MPL 10XBD	0.25	6.5	18.00	4.40	155	100	2.2	18
MPL 20XBD	0.40	1.3	9.00	1.72	160	200	1.1	6.1
MPL 50XBD	0.75	0.38	3.60	0.49	160	500	0.44	1.4
MPL 100XBD	0.90	0.21	1.80	0.34	160	1,000	0.22	0.73

Screw: W26X0.706

Microscope system

A range of focusing units enabling microscopes to conform with UIS optical system.
Compact size enough to be bolted in place or fixed to stand.

BX FM/FM-S



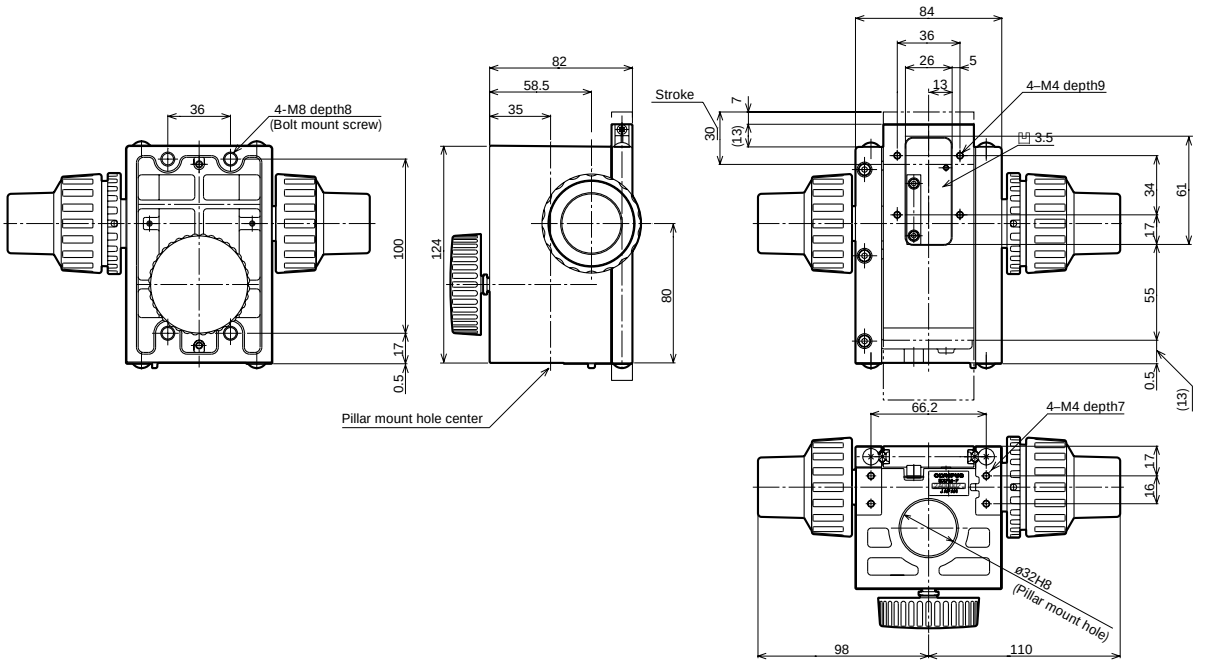
*Different types may be offered in each area.

BXFM frame

BXFM-F

BX FM/FM-S

Widely used system that allows use in combination with fiber illumination, motorized revolving nosepiece and telan lens unit. Can easily be integrated into other equipment.



Weight: 1.9kg

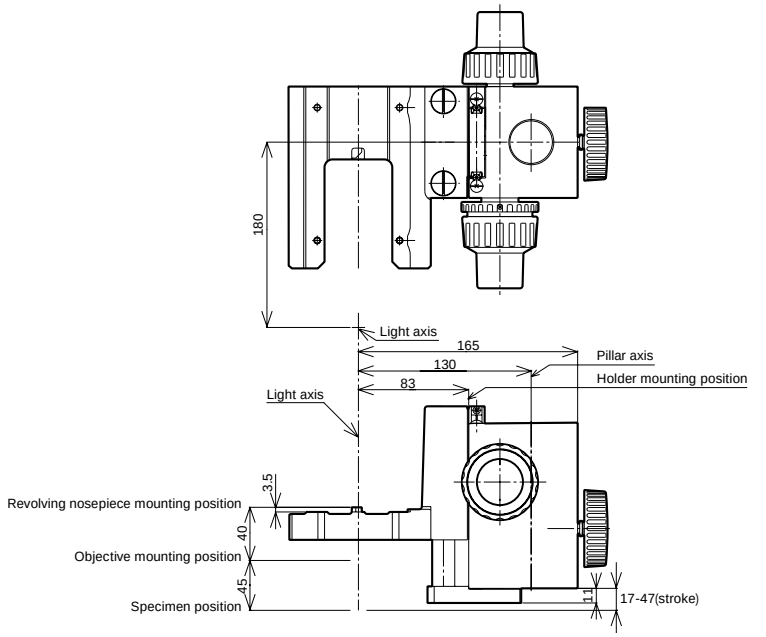
Unit: mm

BXFM

BXFM-F+BXFM-ILH+BXFM-ILHSPU

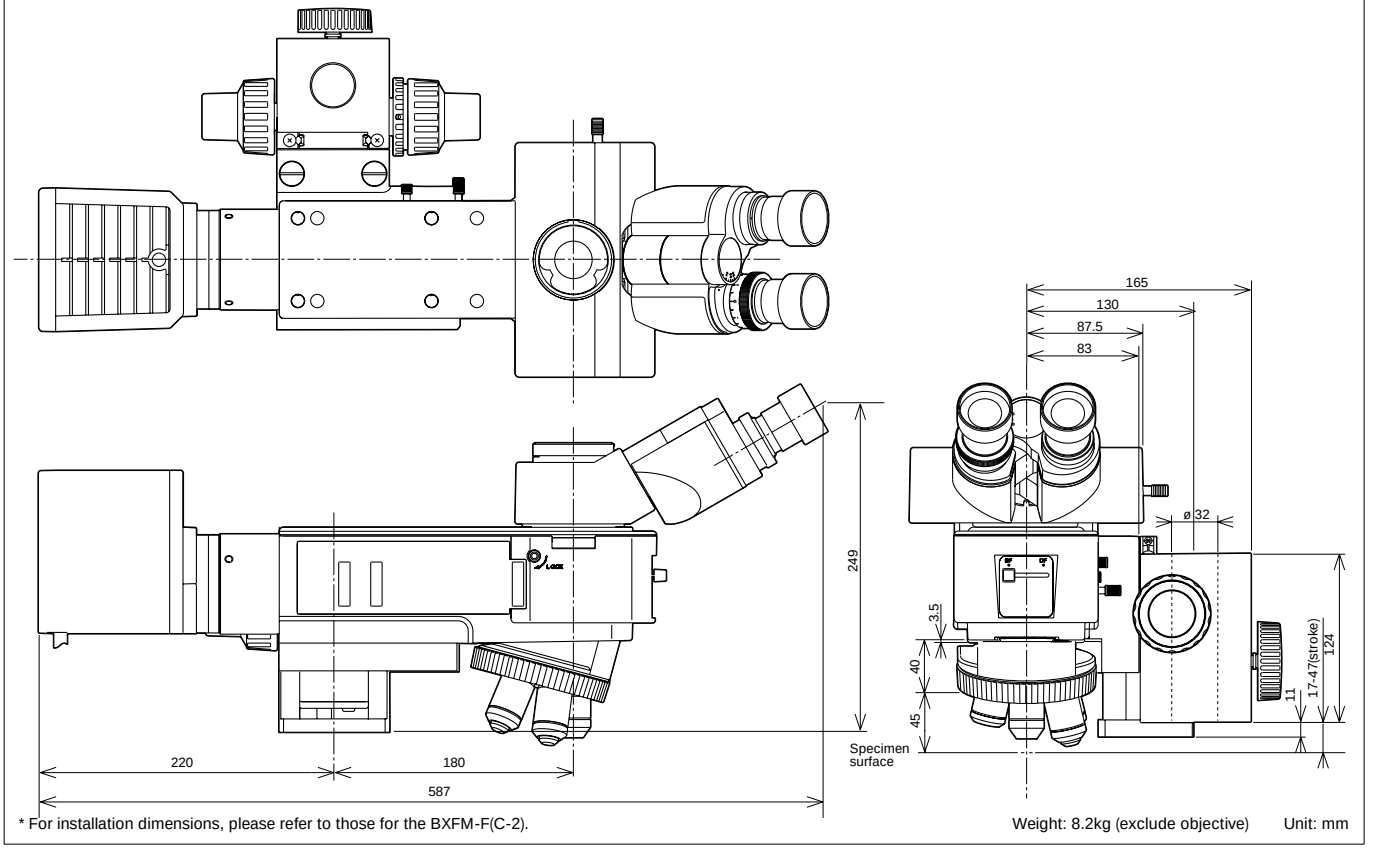
BX FM/FM-S

Accommodates the reflected light brightfield/darkfield and fluorescence illuminators.



Weight: 3.2kg Unit: mm

BXFM combination sample
BXFM-F+BXFM-ILH+BXFM-ILHSPU+TR30-2+BX-RLA2+U-LH100L-3



* For installation dimensions, please refer to those for the BXFM-F(C-2).

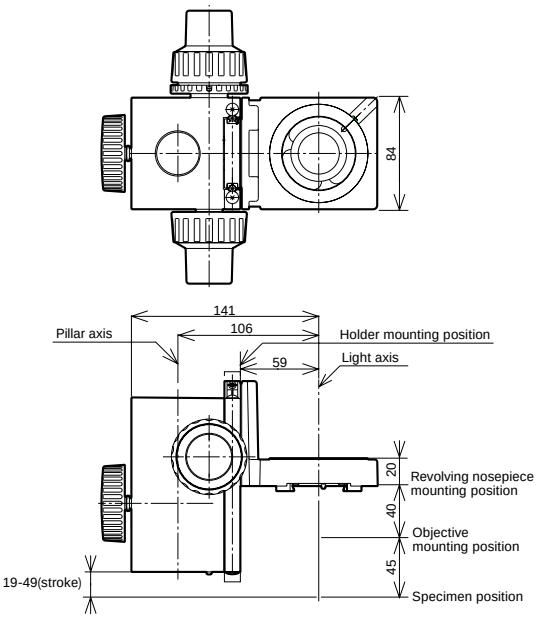
Weight: 8.2kg (exclude objective) Unit: mm

BXFM-S

BXFM-F+BXFM-ILHS

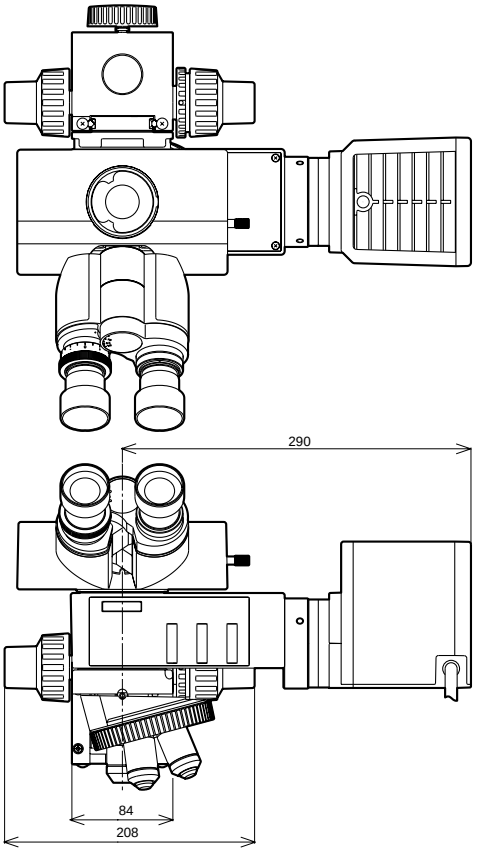
Compact focusing unit suitable for building into existing equipment.

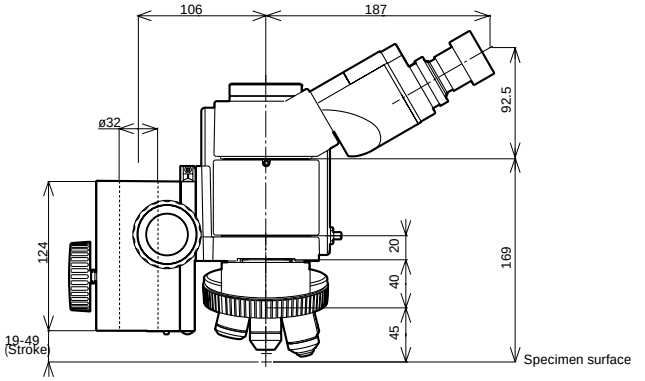
BX FM/FM-S



Weight: 2.4kg Unit: mm

BXFM-S combination sample
BXFM-F+BXFM-ILHS+TR30-2+U-KMAS+U-LH100L-3





* For installation dimensions, please refer to those for the BXFM-F(C-2).

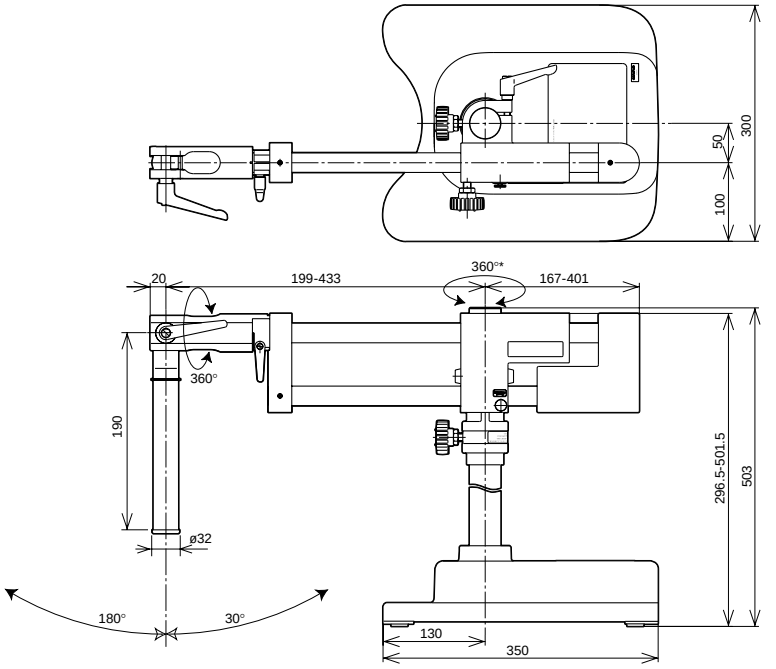
Weight: 5.5kg (exclude objective) Unit: mm

Stands

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

BX FM/FM-S

SZ-STU2
Universal stand



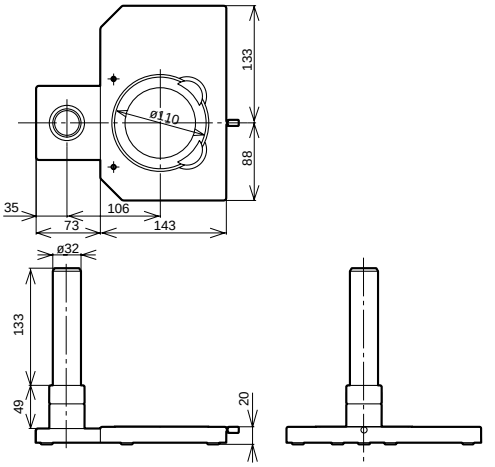
** The rotation angle of the horizontal arm can restrict to 90 degrees with stopper.

Major specifications

	Item	Specifications
1	Diameter of focusing arm or fixing section of tube	ø32mm
2	Vertical pole diameter	ø40mm
3	Horizontal poles diameters	ø25mm (both upper and lower poles)
4	Stroke	Horizontal: 234mm, Vertical: 205mm
5	Movement range	Horizontal: 538mm maximum (Vertical pole — BXFM/BXFM-S optical axis) Vertical: 246mm maximum (Focus plane BXFM/BXFM-S — desk surface)
6	Maximum specimen weight	Forward: 10kg (within 90-degree area) Transverse direction: 6kg Backward direction: 7kg (at maximum stroke)
7	Weight	30kg

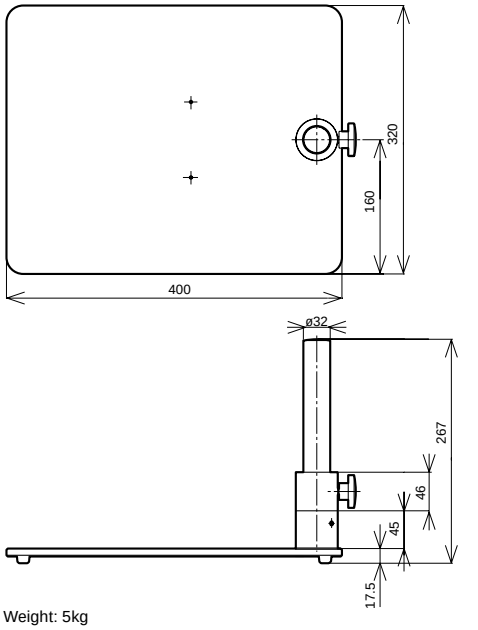
* BXFM/BXFM-S cannot be used together with U-DPT combination

U-ST
Compact stand



Weight: 1.8kg

SZ-STL
Large stand



Weight: 5kg

Unit: mm

Reflected light illuminator for BF/DF

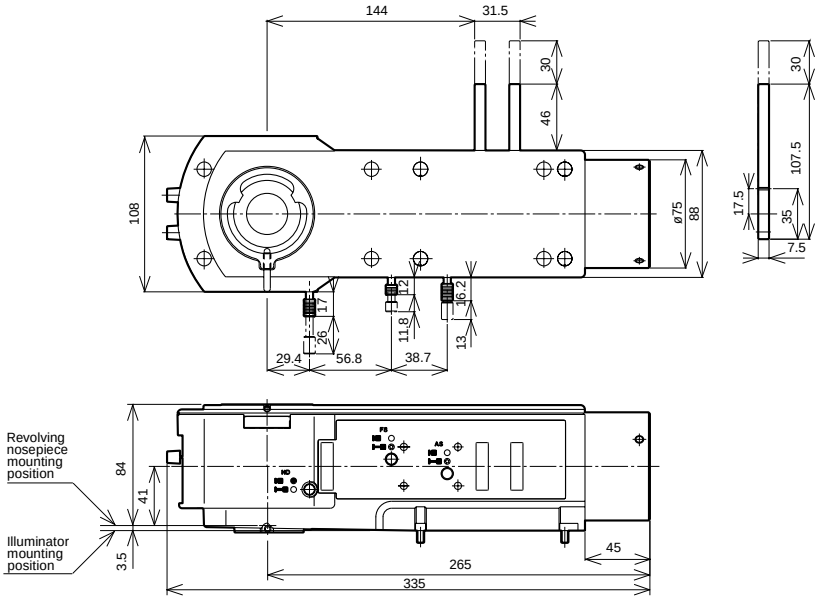
BX-RLA2

BX FM/FM-S | BF/DF | DIC | POL

ND filters are linked when exchanging between brightfield and darkfield.

Accessories

Unit name	Description	Weight (g)
U-25LBD	LBD filter slider	20
U-25IF550	IF550 filter slider	20
U-25ND6	ND filter	20
U-25ND25	ND filter	20
U-25FR	Frost filter slider	20
U-25Y48	Yellow filter	20
U-25L42	UV-cut filter	20
U-PO3	Polarizer slider for reflected light	71
U-POTP3	Polarizer slider for reflected light with tint plate	71
U-AN360-3	360° rotatable analyzer slider	79
U-AN	Analyzer slider for reflected light	50
U-DICR	DIC slider for reflected light	130
U-DICRH	DIC slider for reflected light (high resolution type)	130
U-DICRHC	DIC slider for reflected light (high contrast type)	130



Weight: 3.4kg

Universal reflected light illuminator

BX-URA2

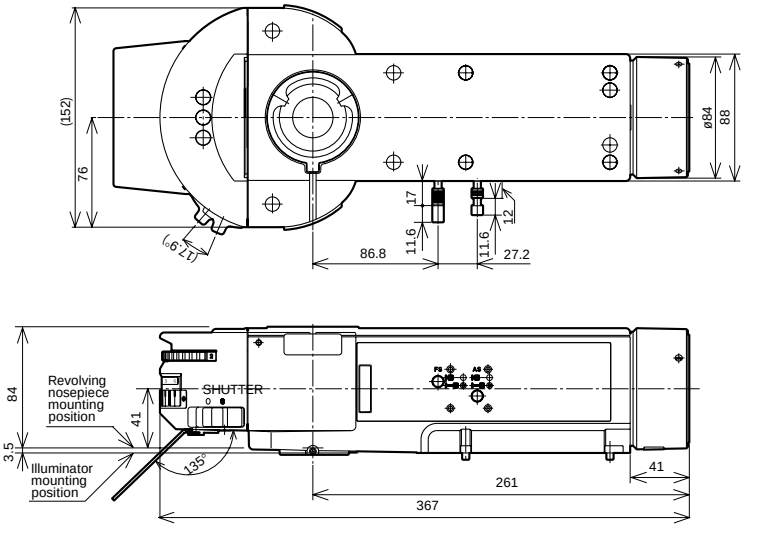
BF/DF | DIC | POL | FL

Suitable for observations ranging from brightfield to fluorescence.

Six mirror units can be attached to this reflected light illuminator simultaneously.

Accessories

Unit name	Description	Weight (g)
U-25LBD	LBD filter slider	20
U-25IF550	IF550 filter slider	20
U-25ND6	ND filter	20
U-25ND25	ND filter	20
U-25FR	Frost filter slider	20
U-25Y48	Yellow filter	20
U-25L42	UV-cut filter	20
U-PO3	Polarizer slider for reflected light	71
U-POTP3	Polarizer slider for reflected light with tint plate	71
U-AN360-3	360° rotatable analyzer slider	79
U-AN	Analyzer slider for reflected light	50
U-DICR	DIC slider for reflected light	130
U-DICRH	DIC slider for reflected light (high resolution type)	130
U-DICRHC	DIC slider for reflected light (high contrast type)	130
U-MBF3	Mirror unit for reflected brightfield	80
U-MDF3*	Mirror unit for reflected darkfield	80
U-MDIC3	Mirror unit for reflected DIC	80
U-MBFL3	Mirror unit for reflected brightfield, for high intensity light source	80
U-MWUS3	Fluorescence mirror unit for reflected (U excitation)	80
U-MWBS3	Fluorescence mirror unit for reflected (B excitation)	80
U-MWGS3	Fluorescence mirror unit for reflected (G excitation)	80



Weight: 3.8kg

* U-RCV (DF converter for BX-URA2) is needed with darkfield observation.

Unit: mm

Reflected light illuminators for BF

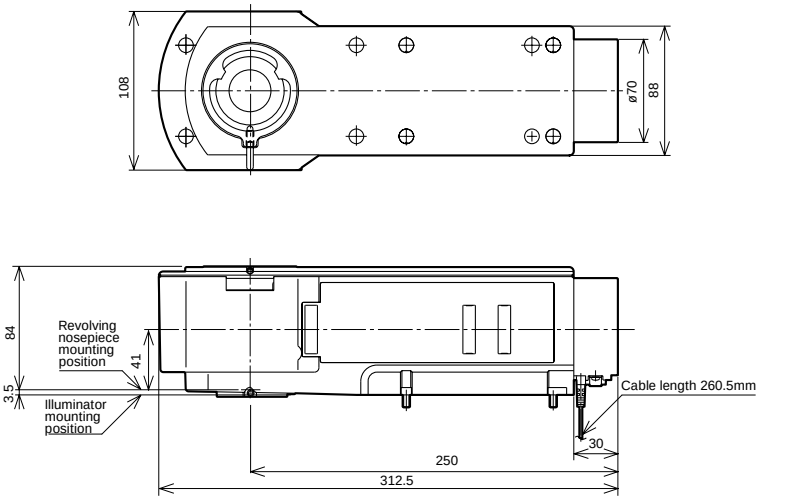
BX-KMA/BX-KMA-ESD

BX FM/FM-S BF DIC POL

Enables brightfield, Nomarski DIC and simple polarizing observations.
ESD model is also available.

Accessories

Unit name	Description	Weight (g)
U-25LBD	LBD filter slider	20
U-25IF550	IF550 filter slider	20
U-25ND6	ND filter	20
U-25ND25	ND filter	20
U-25FR	Frost filter slider	20
U-25Y48	Yellow filter	20
U-25L42	UV-cut filter	20
U-PO3	Polarizer slider for reflected light	71
U-POTP3	Polarizer slider for reflected light with tint plate	71
U-AN360-3	360° rotatable analyzer slider	79
U-AN	Analyzer slider for reflected light	50
U-DICR	DIC slider for reflected light	130
U-DICRH	DIC slider for reflected light (high resolution type)	130
U-DICRHC	DIC slider for reflected light (high contrast type)	130

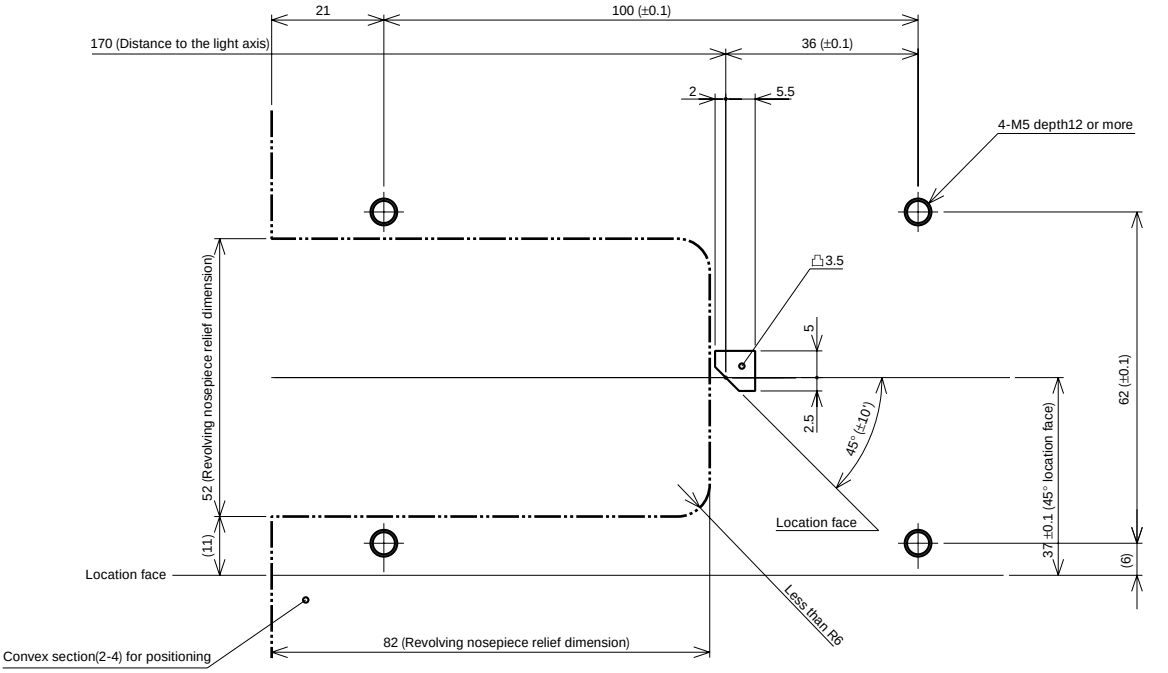


Weight: 3.1kg

* Combine SZX-TLGAD when using fiber illumination.

Unit: mm

MOUNTING DIMENSIONS OF ILLUMINATORS (BX-RLA2, BX-URA2 and BX-KMA/BX-KMA-ESD)



Fix illuminator using four M5 screws and projection for fastening.

Unit: mm

Reflected light illuminator for BF

U-KMAS

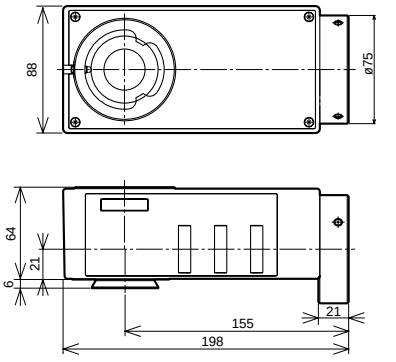
* BX FM/FM-S BF DIC POL

Very compact reflected light illuminator with reduced depth.

* BXFM-S only

Accessories

Unit name	Description	Weight (g)
U-25LBD	LBD filter slider	20
U-25IF550	IF550 filter slider	20
U-25ND6	ND filter	20
U-25ND25	ND filter	20
U-25FR	Frost filter slider	20
U-25Y48	Yellow filter	20
U-25L42	UV-cut filter	20
U-PO3	Polarizer slider for reflected light	71
U-POTP3	Polarizer slider for reflected light with tint plate	71
U-AN360-3	360° rotatable analyzer slider	79
U-AN	Analyzer slider for reflected light	50
U-DICR	DIC slider for reflected light	130
U-DICRH	DIC slider for reflected light (high resolution type)	130
U-DICRHC	DIC slider for reflected light (high contrast type)	130



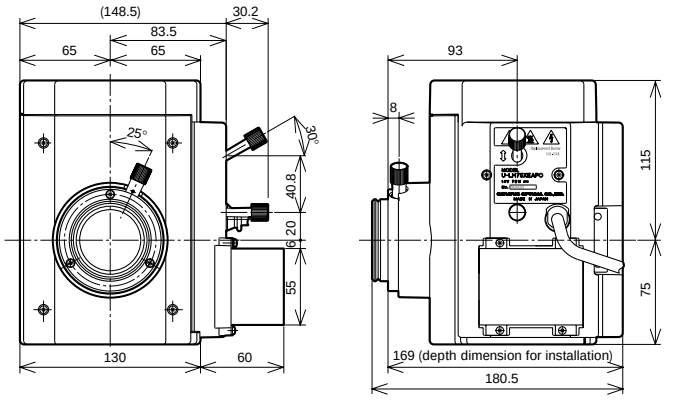
Weight: 1.2kg

Unit: mm

Lamphousings

Various different lamp housings are available, for use with different light sources:
choose to suit the intended purpose.

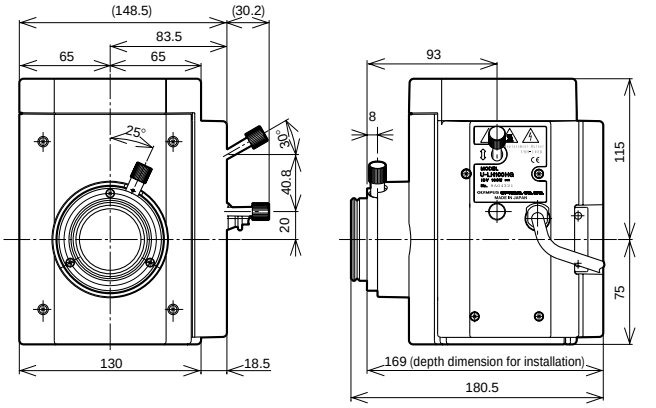
U-LH75XEAPO
75W xenon apo lamphousing



Cable length 2,000mm Weight: 3.1kg

*Power supply unit (AH2-RX-T or U-RX-T200) and power cable (UYCP) are necessary for 75W xenon lamphousing. These items are sold separately.
AH2-RX-T: dimensions 120(W)×290(D)×186(H), weight approx. 4kg / U-RX-T200 (for EU countries): dimensions 115(W)×195(D)×260(H), weight approx. 3kg
Note: Supplied by Olympus Optical Co. (Europa) GmbH and its business partners.

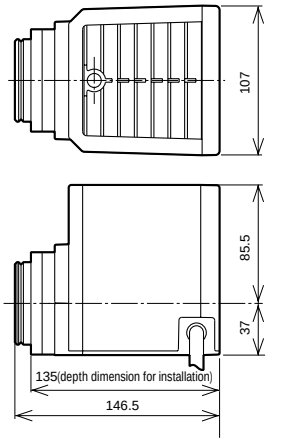
U-LH100HGAPO/U-LH100HG
100W mercury apo lamphousing/100W mercury lamphousing



Cable length 2,000mm Weight: 2.7kg

* Power supply unit (BH2-RFL-T3 or U-RFL-T200) and power cable (UYCP) are necessary for 100W mercury lamphousings. These items are sold separately.
BH2-RFL-T3: dimensions 120(W)×290(D)×225(H), weight approx 5kg / U-RFL-T200 (for EU countries): dimensions 150(W)×295(D)×200(H), weight approx. 4.8kg

U-LH100-3/U-LH100IR/U-LH100L-3
100W halogen lamphousings



Cable length U-LH100-3: 290mm Weight: 880g
U-LH100IR: 290mm
U-LH100L-3: 800mm

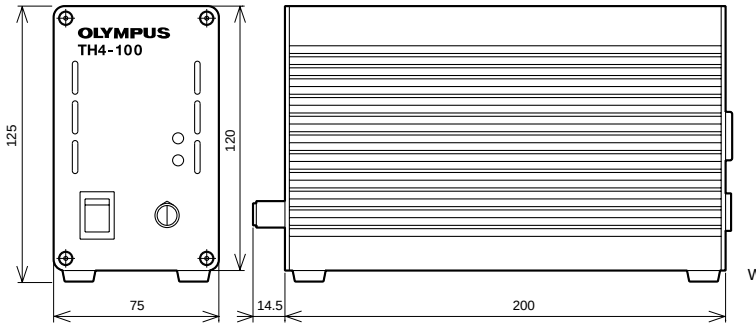
* External power supply (TH4-100 or TH4-200) and power cable (UYCP) are necessary for 100W halogen lamp-housings. These items are sold separately. For TH4-100/200 installation dimensions, please refer to E-2.

Unit: mm

Lamphousing accessories

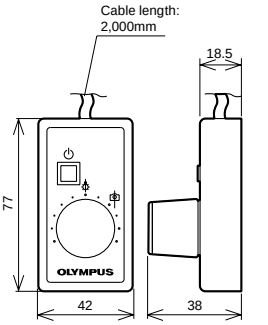
All Olympus reflected light illuminators can be used with fiber illumination. External power supply TH4/-100/200 are provided. For the 100W halogen lamp, an intensity adjustment switch is located close to the operator's hand.

TH4-100/200
External power supply



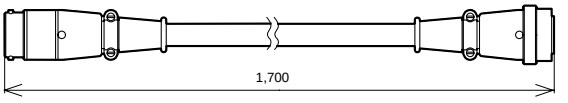
Weight: 2.2kg

TH4-HS
Hand switch



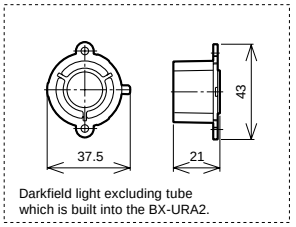
Weight: 140g

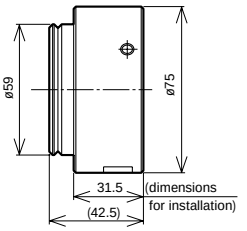
U-RMT
Extension cord



Weight:200 g

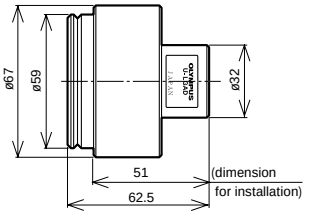
U-RCV
DF converter for BX-URA2





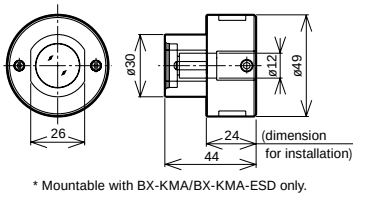
Weight: 315g

U-LGAD
Fiber adapter for reflected light observation



Light guide mount hole ø12
Weight: 390g

SZX-TLGAD
Transmitted light guide adapter



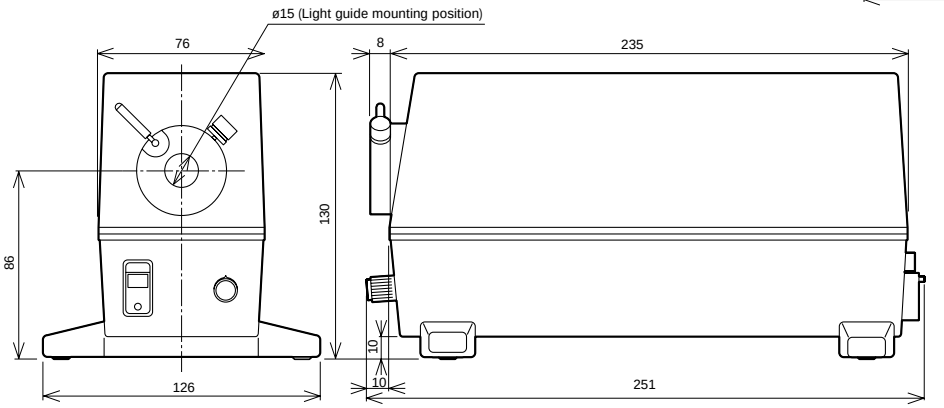
* Mountable with BX-KMA/BX-KMA-ESD only.

Light guide mount hole ø12
Weight: 135g

Unit: mm

LAMPHOUSING & ACCESSORIES

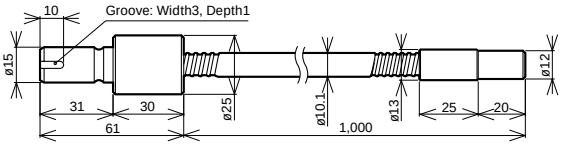
LG-PS2*
Light source



*The types of model varies by country in use.

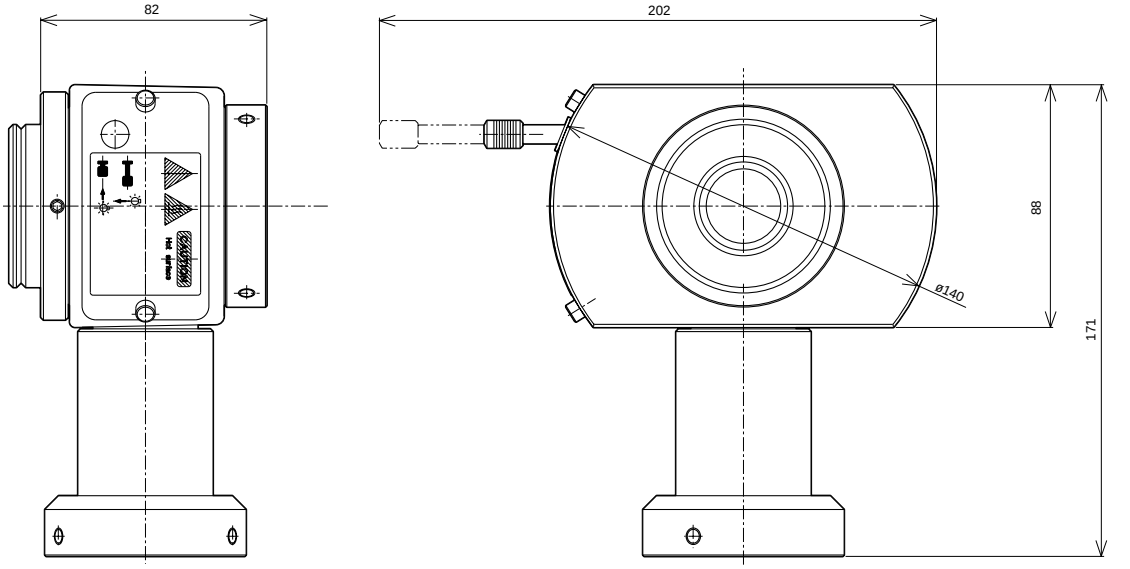
Weight: 1.6kg

LG-SF
Light guide



Weight: 210g

U-DULHA
Double lamp house adapter



Weight: 1.2kg

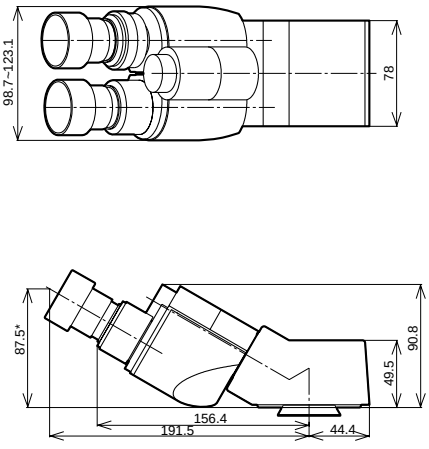
Unit: mm

Widefield observation tubes

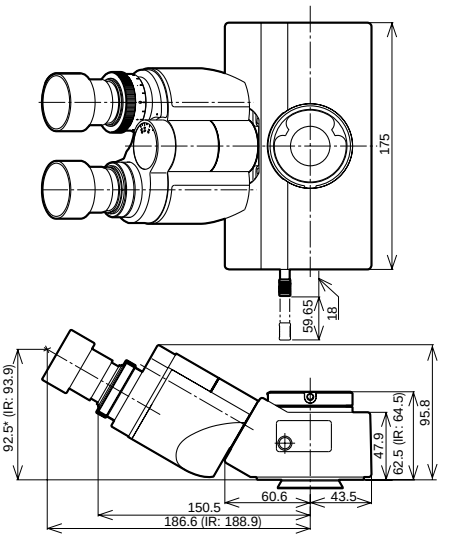
Observation tubes with widefield of view. Compatible with F.N. 22.

Four types of observation tubes (binocular, trinocular, erect image trinocular and tilting binocular) are provided.

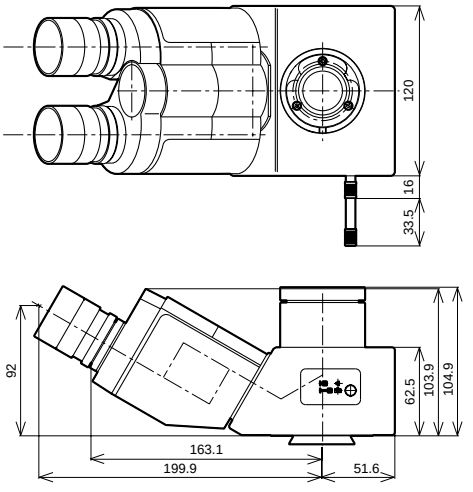
U-BI30-2
Widefield binocular tube BX FM/FM-S



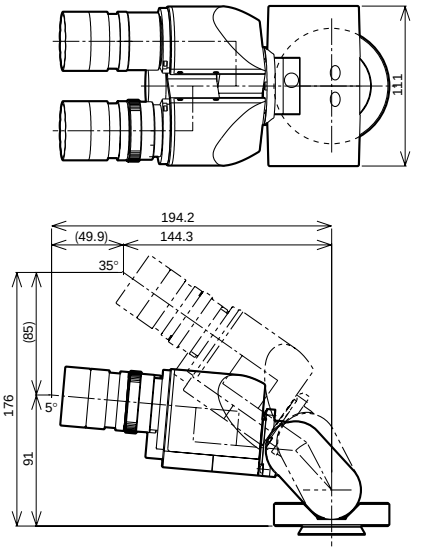
U-TR30-2/U-TR30IR
Widefield binocular tube/
Widefield binocular tube for IR
BX FM/FM-S



U-ETR-4
Widefield erect image trinocular tube BX FM/FM-S



U-TBI3
Tilting binocular tube BX FM/FM-S



Unit: mm

Name	Field Number (F.N.)	Inclination angle (degree)	Interpupillary distance (mm)	Light path selector (eyepiece/video port)	Observation image	Weight (g)
U-BI30-2	22	30	50-76	—	Inverted	900
U-TR30-2	22	30	50-76	100/0, 20/80, 0/100	Inverted	1,600
U-TR30IR	22	30	50-76	100/0, 0/100	Inverted	1,600
U-ETR-4	22	30	50-76	100/0, 0/100	Erect	1,900
U-TBI3	22	5-35	50-76	—	Inverted	1,300

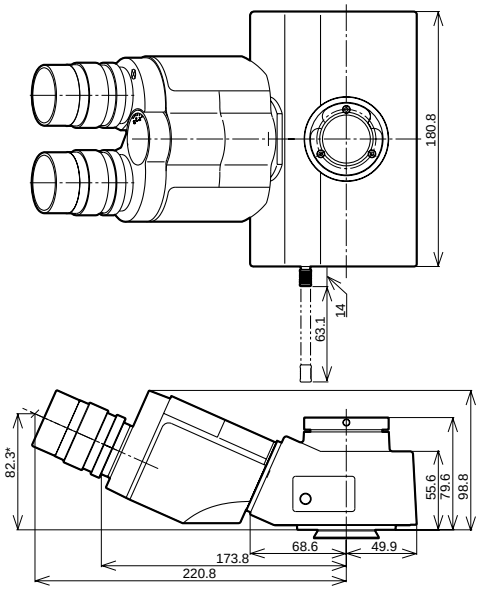
*Length marked with an asterisk (*) may vary according to interpupillary distance. The distance for figure shown is 62mm.

Super widefield observation tubes/single port tube with lens

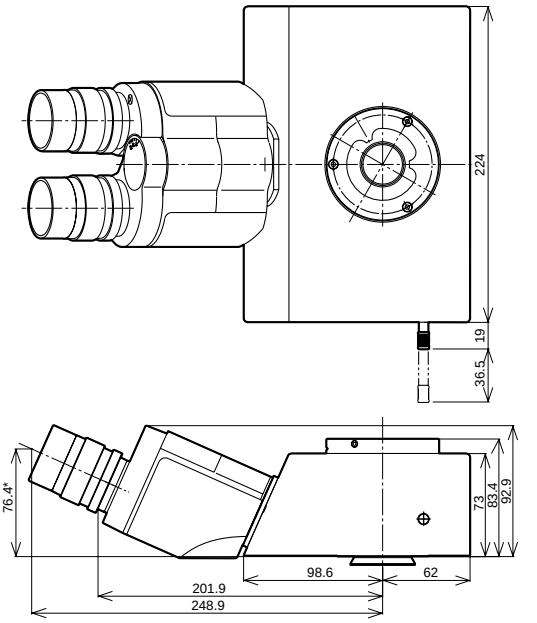
Observation tubes with super widefield of view. Compatible with F.N. 26.5. Three types of observation tubes (trinocular, erect image trinocular and erect image tilting trinocular) are provided.

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

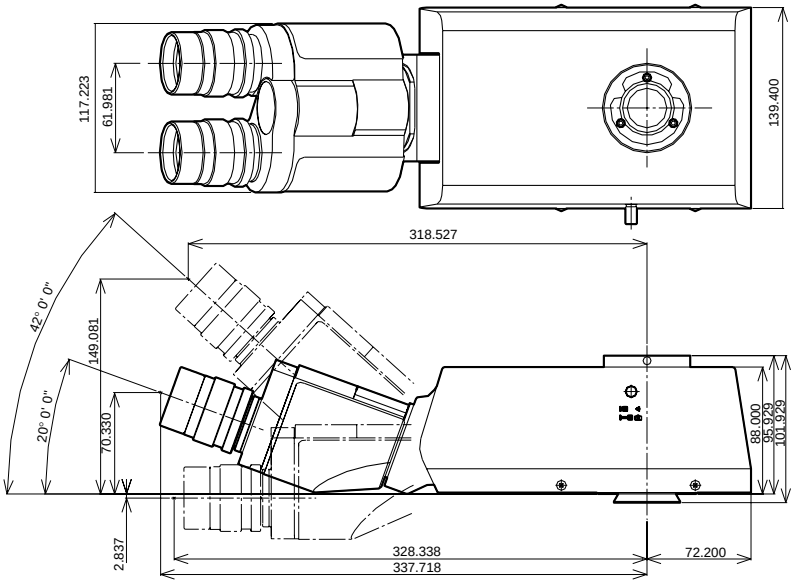
U-SWTR-3
Super widefield trinocular tube
BX FM/FM-S



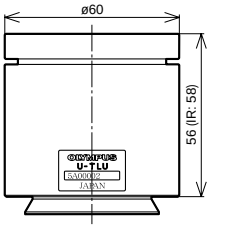
U-SWETR
Super widefield erect image trinocular tube



MX-SWETTR
Super widefield erect image tilting trinocular tube



U-TLU/U-TLUIR
Single port tube with lens/
Single port tube with lens for IR
BX FM/FM-S



Weight: 350g

- For attachable video camera adapters, please refer to video camera adapters system diagram page (J-1).

Unit: mm

Name	Field Number (F.N.)	Inclination angle (degree)	Interpupillary distance (mm)	Light path selector (eyepiece/video port)	Observation image	Weight (g)
U-SWTR-3	26.5	24	50-76	100/0, 20/80, 0/100	Inverted	2,300
U-SWETR	26.5	24	50-76	100/0, 0/100	Erect	4,200
MX-SWETTR	26.5	0-42	50-76	100/0, 0/100	Erect	4,200

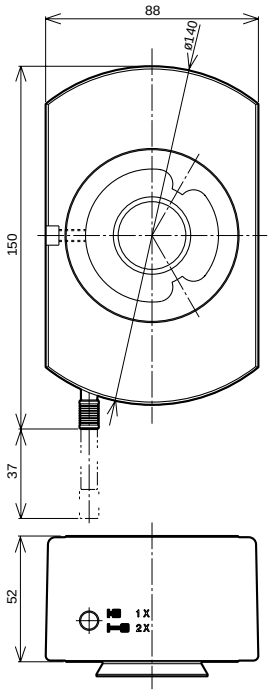
*Length marked with an asterisk (*) may vary according to interpupillary distance. The distance for figure shown is 62mm.

Intermediate tubes

Various accessories for various observation need.

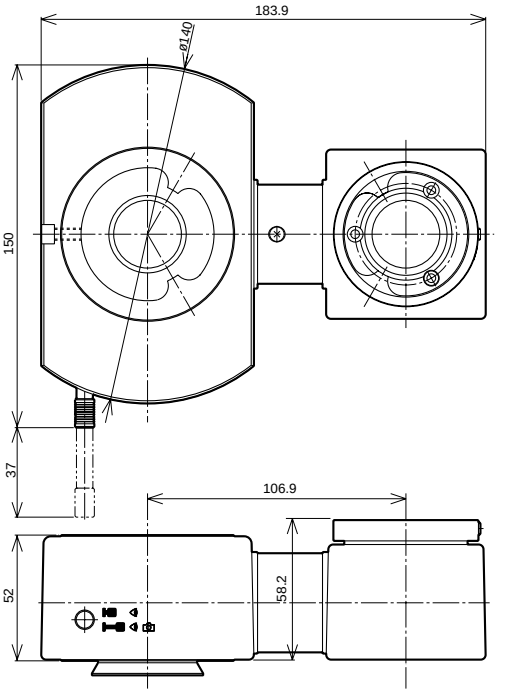
BX
FM/FM-S

U-ECA
Magnification changer 2x
Provides 1x and 2x intermediate magnifications.



Weight: 1.3kg

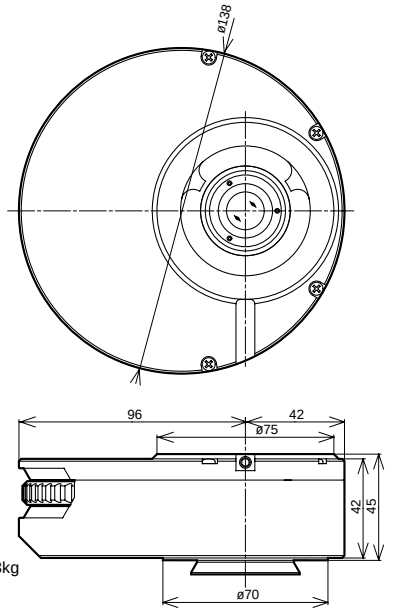
U-TRU
Trinocular intermediate attachment
Intermediate attachment which divides the light path,
allowing attachment of both 35mm and video cameras.



BI:PT=100:0/20:80

Weight: 1.3kg

U-CA
Magnification changer
Provides 1x, 1.2x, 1.6x and 2x intermediate magnifications.

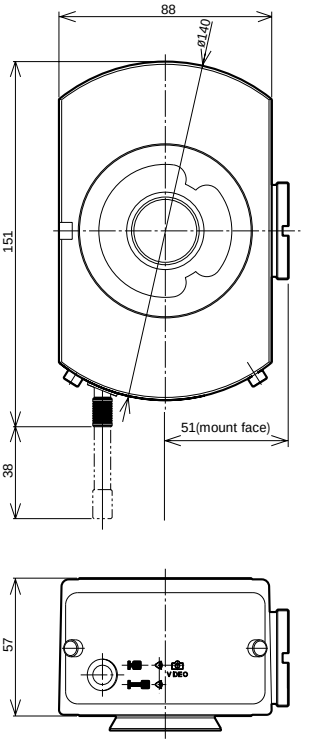


Weight: 1.3kg

Unit: mm

INTERMEDIATE TUBES & ACCESSORIES

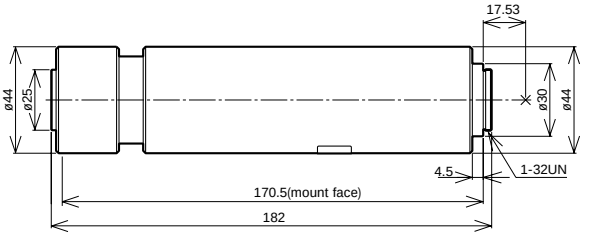
U-DP
Dual port
Use this intermediate tube to divide the light path.



Weight: 1kg

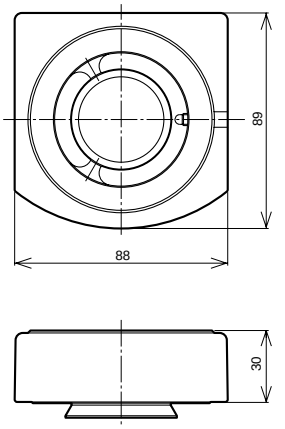
Transmitted light port: side port=100:0 (light divided by mirror unit)

U-DP1xC
Dual port 1x
Combine with U-DP to obtain a 1x image.



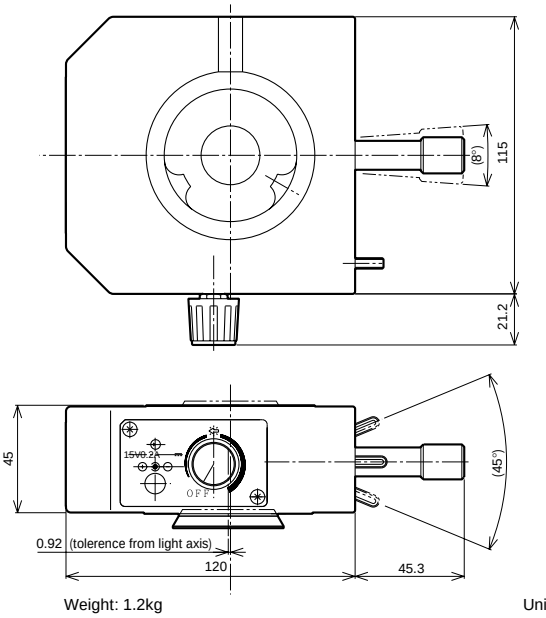
Weight: 500g

U-EPA2
Eyepoint adjuster
Raises eyepoint by 30mm.



Weight: approximately 500g

U-APT
Arrow pointer
Projects an arrow into the field of view.



Weight: 1.2kg

Unit: mm

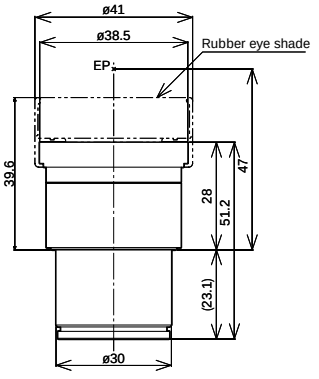
UIS EYEPIECES
FILAR MICROMETER EYEPIECE

UIS eyepieces

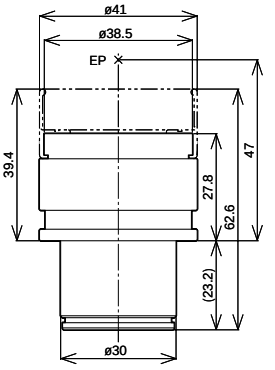
Eyepieces for UIS optical system.

BX FM/FM-S

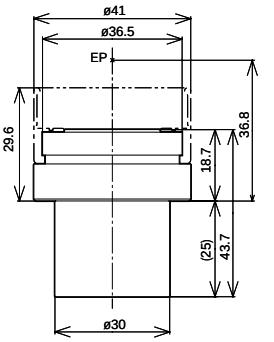
WHN10X
Widefield eyepiece



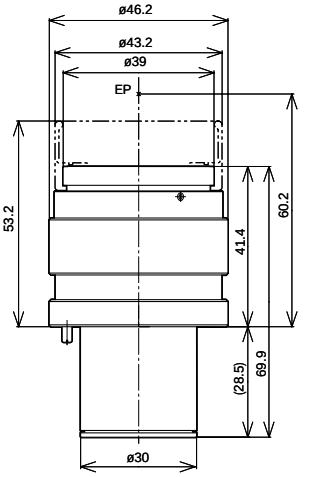
WHN10X-H
CROSS WHN10X
Widefield eyepieces



WH15X
Widefield eyepiece



SWH10X-H
MICRO SWH10X
CROSS SWH10X
Super widefield eyepieces



Name	Field Number	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
CROSS WHN10X	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

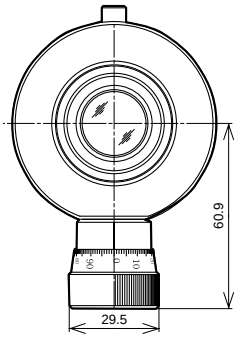
Unit: mm

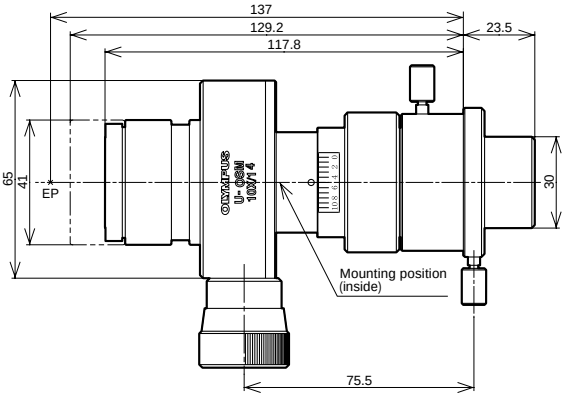
Filar micrometer eyepiece

U-OSM

Used for precise measurement in the field of view.

BX FM/FM-S





Weight: 580g

Eyepiece	Magnification 10X, erect image (inverted when used with erect image observation tube), F.N. 14. Diopter adjustment range: ±5 1/m. Provided with rubber eye shade.
Measuring scale	Scale lines graduated in increments of 1mm in the entire 10mm length. Shift of scale lines: 1mm per rotation of the shift ring, the circumference of which is divided into 100 graduations.
Measuring range	10mm/objective magnification
Compensation limit for objective magnification tolerance	±5% by combined use of the zoom compensation ring and the provided stage micrometer. Compensation ring clamping screw. Magnification compensation scale.
Actual size	Actual size (mm) = $\frac{\text{Measured value (mm)}}{\text{Objective magnification}}$
Repeatability	Repeatability error ± $\frac{0.007}{A}$ mm (A … Objective magnification)
Accuracy	*Measuring error (A … Objective magnification: L … Measured length in mm) ±[(0.0002XA+0.002) L + $\frac{0.007}{A}$] mm

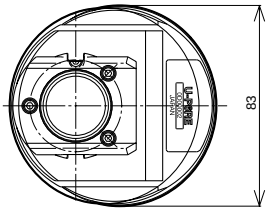
Unit: mm

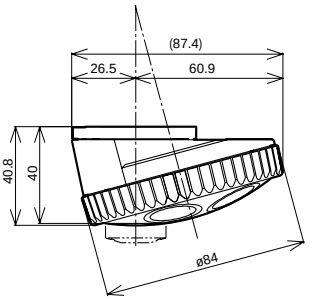
Revolving nosepieces for BF objectives

Choose from following 7 types.

BX
FM/FM-S

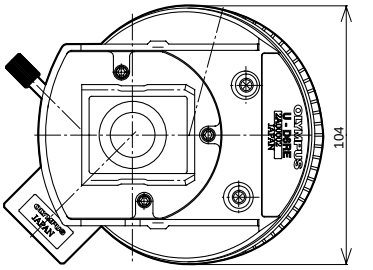
U-5RE-2
Quintuple revolving nosepiece

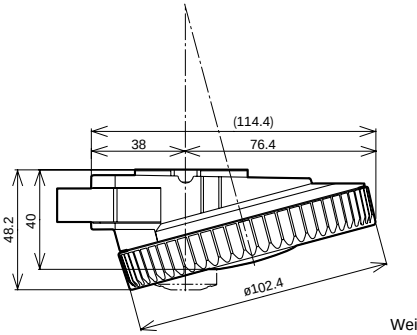




Weight: 520g

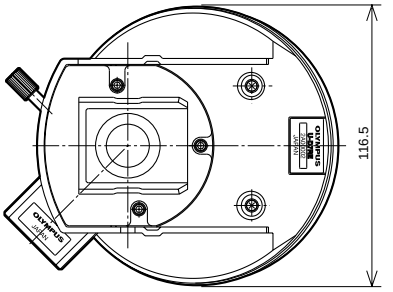
U-D6RE/U-D6RE-ESD
Sextuple revolving nosepiece with slider slot for DIC/with ESD treatment

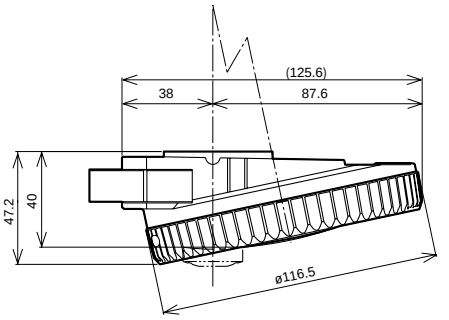




Weight: 800g

U-D7RE
Septuple revolving nosepiece with slider slot for DIC



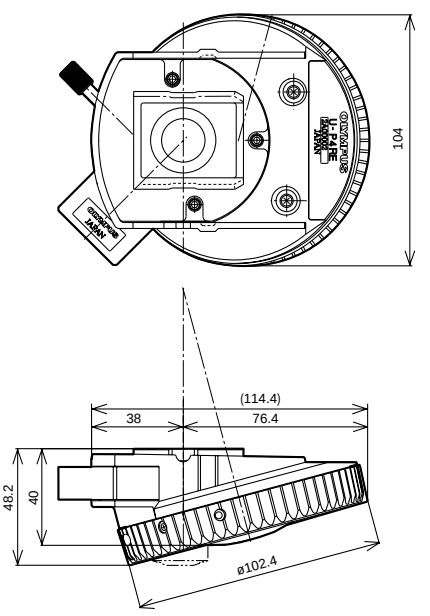


Weight: 980g

Unit: mm

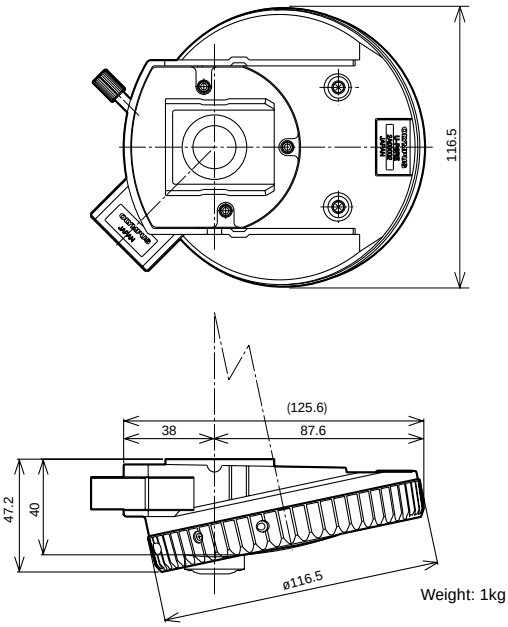
REVOLVING NOSEPIECES

U-P4RE
Centerable quadruple revolving nosepiece
with slider slot for DIC



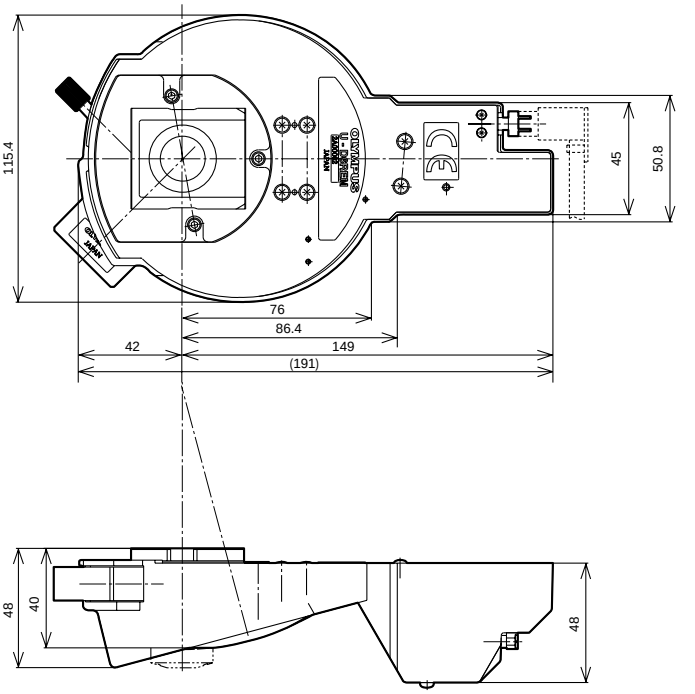
Weight: 1kg

U-P6RE
Centerable sextuple revolving nosepiece
with slider slot for DIC



Weight: 1kg

U-D6REM *
Motorized sextuple revolving nosepiece with slider slot for DIC



*Power supply unit (U-REMPS-2), hand switch (U-HS) and power cable (UYCP) are necessary for motorized revolving nosepiece.

Weight: 1.1kg

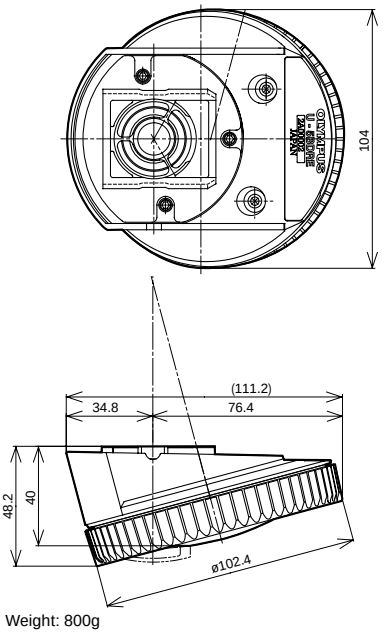
Unit: mm

Revolving nosepieces for BF/DF objectives

Choose from following 5 types.

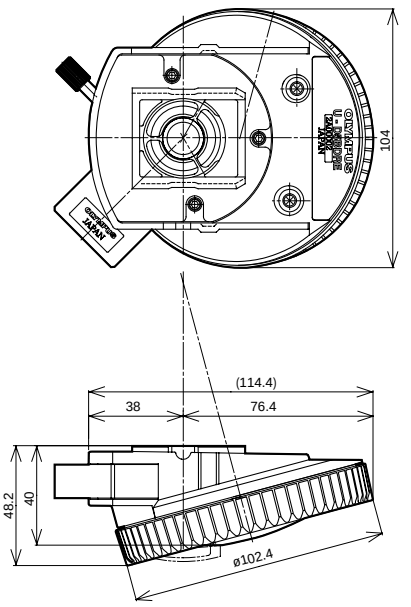
Use of adapter to mount BF objectives (BD-M-AD) enables attachment of brightfield objectives.

U-5BDRE
Quintuple revolving nosepiece for BF/DF



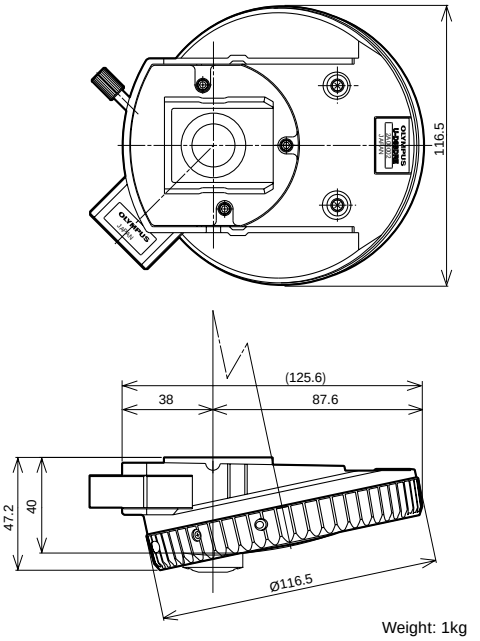
Weight: 800g

U-D5BDRE
Quintuple revolving nosepiece for BF/DF with slider slot for DIC



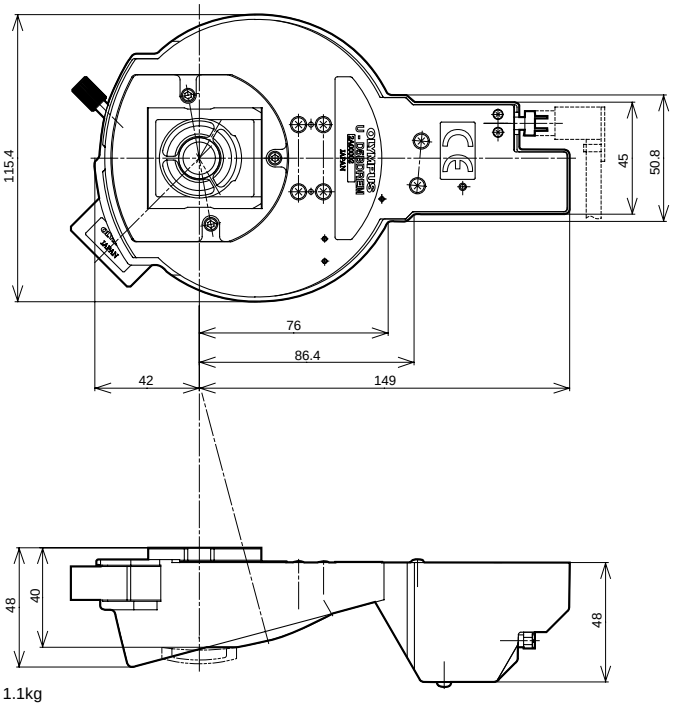
Weight: 800g

U-D6BDRE/U-P5BDRE
Sextuple revolving nosepiece for BF/DF with slider slot for DIC/
Centerable quintuple revolving nosepiece



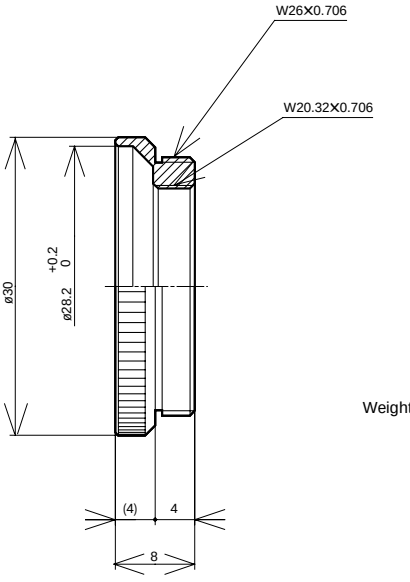
Weight: 1kg

U-D5BDREM *
Motorized quintuple revolving nosepiece for BF/DF with slider slot for DIC



Weight: 1.1kg

BD-M-AD
Adapter to mount BF objectives



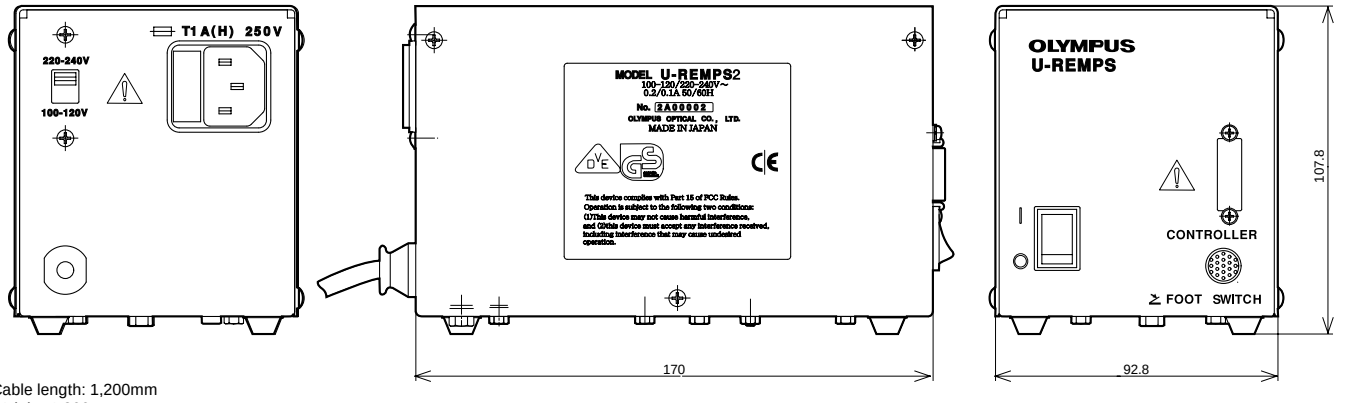
Weight: 10g

*Power supply unit (U-REMPS-2), hand switch (U-HS) and power cable (UYCP) are necessary for motorized revolving nosepiece.

Unit: mm

Power supply unit for motorized revolving nosepiece

U-REMPS-2



Cable length: 1,200mm
Weight: 1,800g

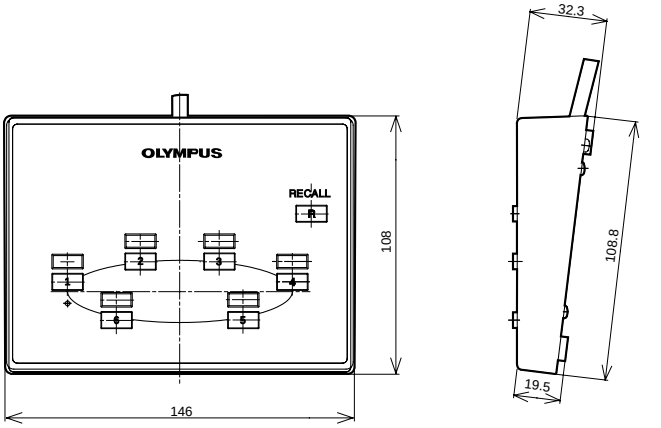
* For U-D6REM and U-D5BDREM. Does not control U-D6REMC, U-D5BDREMC and P5REMC.

Unit: mm

Hand switch unit for motorized revolving nosepiece

U-HS

Operation unit that enables to change the objective position of the revolving nosepiece remotely.

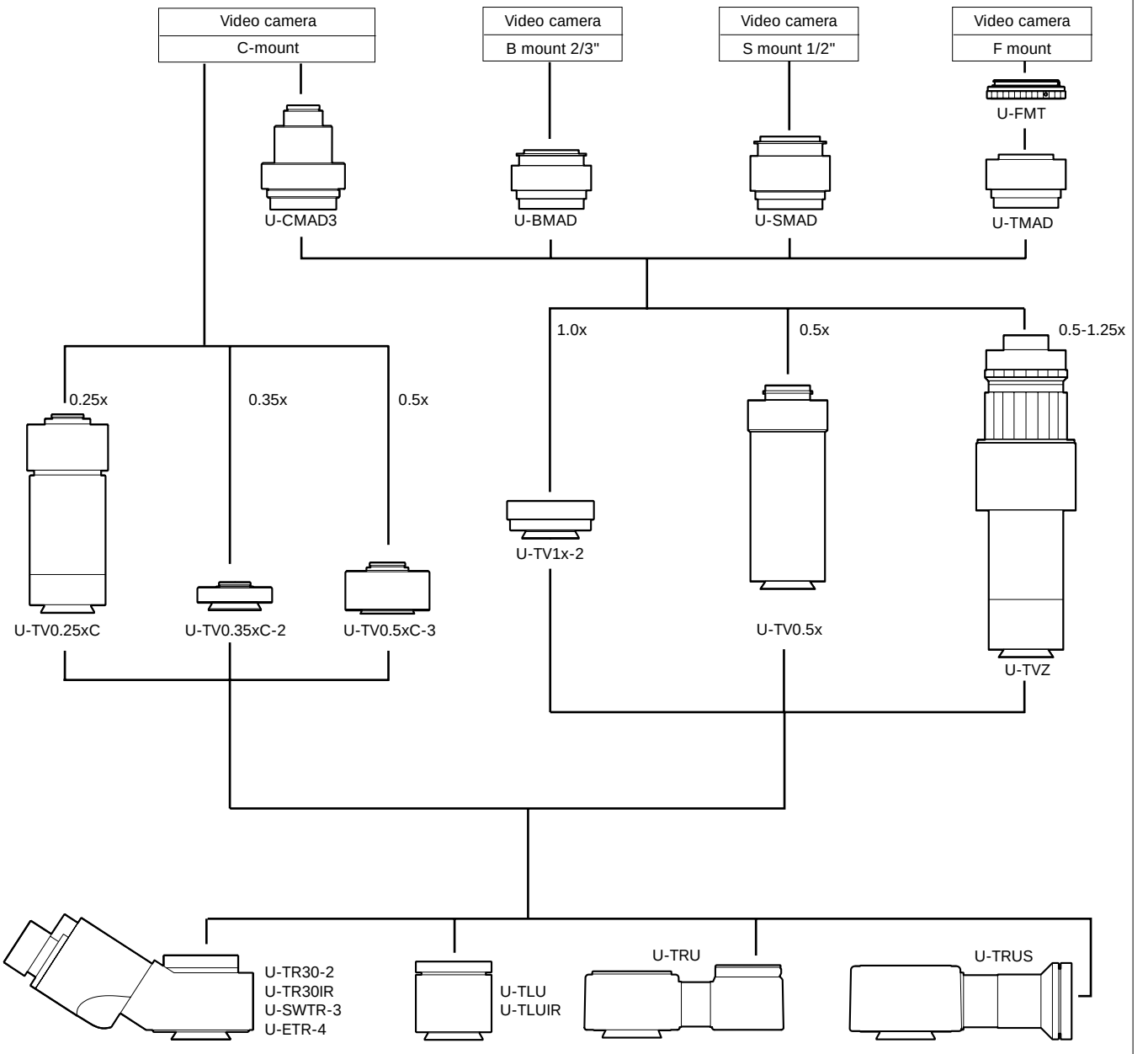


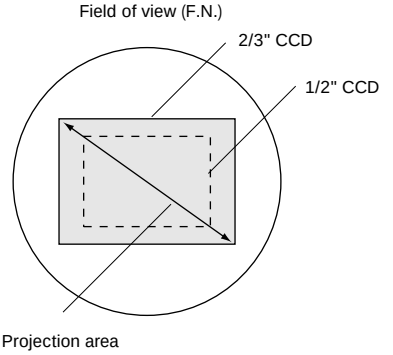
Cable length: 860mm
Weight: 400g

Unit: mm

VIDEO CAMERA ADAPTERS

SYSTEM DIAGRAM





Video camera adapter (Projection lens)	Projection magnifications	Projection area (F.N.)		
		2/3"CCD	1/2"CCD	1/3"CCD
U-TVZ	0.5x-1.25x	22-8.8	16-6.4	12-4.8
U-TV1x-2	1x	11	8	6
U-TV0.5x	0.5x	22	16	12
U-TV0.5xC-3	0.5x	22	16	12
U-TV0.35xC-2	0.35x	—	22	17.1
U-TV0.25xC	0.25x	—	—	24

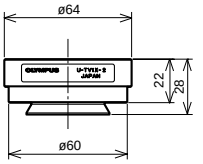
$$\text{Practical field of view (mm)} = \frac{\text{Projection area (Field Number)}}{\text{Objective magnifications}}$$

Video camera ports

Three types are provided, with built-in 0.5x and zoom lens.
These ports can be attached directly to the trinocular observation tube.
The video camera mount adapter (J-4) ensures compliance with different types of video cameras.

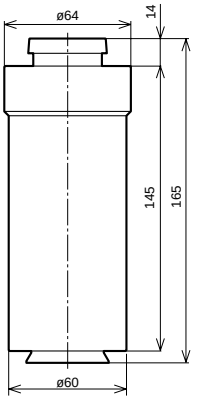
BX FM/FM-S

U-TV1X-2
Video port 1X



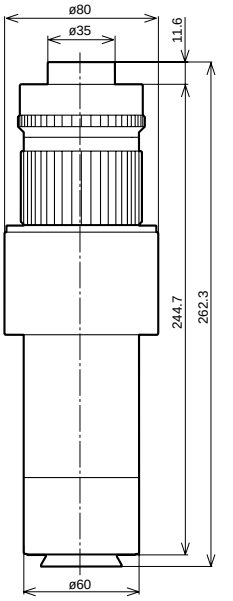
Weight: 150g

U-TV0.5X
Video port with 0.5X lens



Weight: 750g

U-TVZ
Zoom video port
0.5X-1.25X



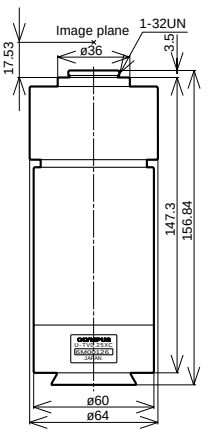
Weight: 2kg

C-mount video camera ports

Allows direct attachment of a C mount video camera.
Three types are provided: 0.5x, 0.35x and 0.5x.

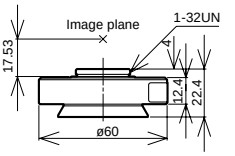
BX FM/FM-S

U-TV0.25XC
C-mount video port with 0.25X lens



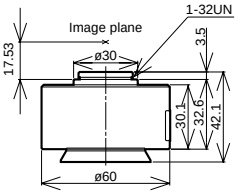
Weight: 1.2kg

U-TV0.35XC-2
C-mount video port with 0.35X lens



Weight: 100g

U-TV0.5XC-3
C-mount video port with 0.5X lens



Weight: 200g

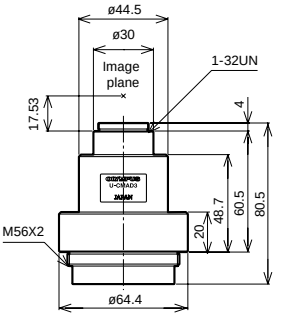
Unit: mm

Video camera mount adapters

Allows attachment to video cameras with C, Bayonet, Sony and F mounts.

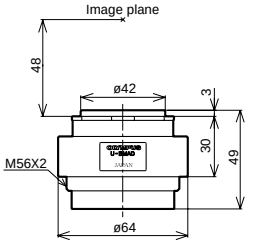
BX
FM/FM-S

U-CMAD3
C-mount adapter



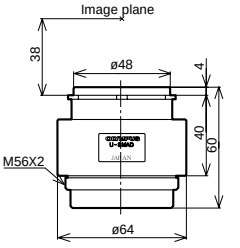
Weight: 165g

U-BMAD
Bayonet mount adapter



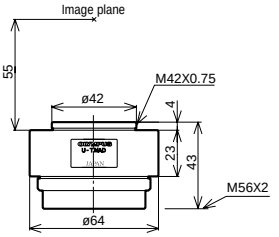
Weight: 80g

U-SMAD
Sony mount adapter



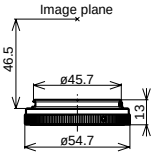
Weight: 90g

U-TMAD
T mount adapter



Weight: 70g

U-FMT
F/T mount adapter *



* It must be combined with U-TMAD

Weight: 30g

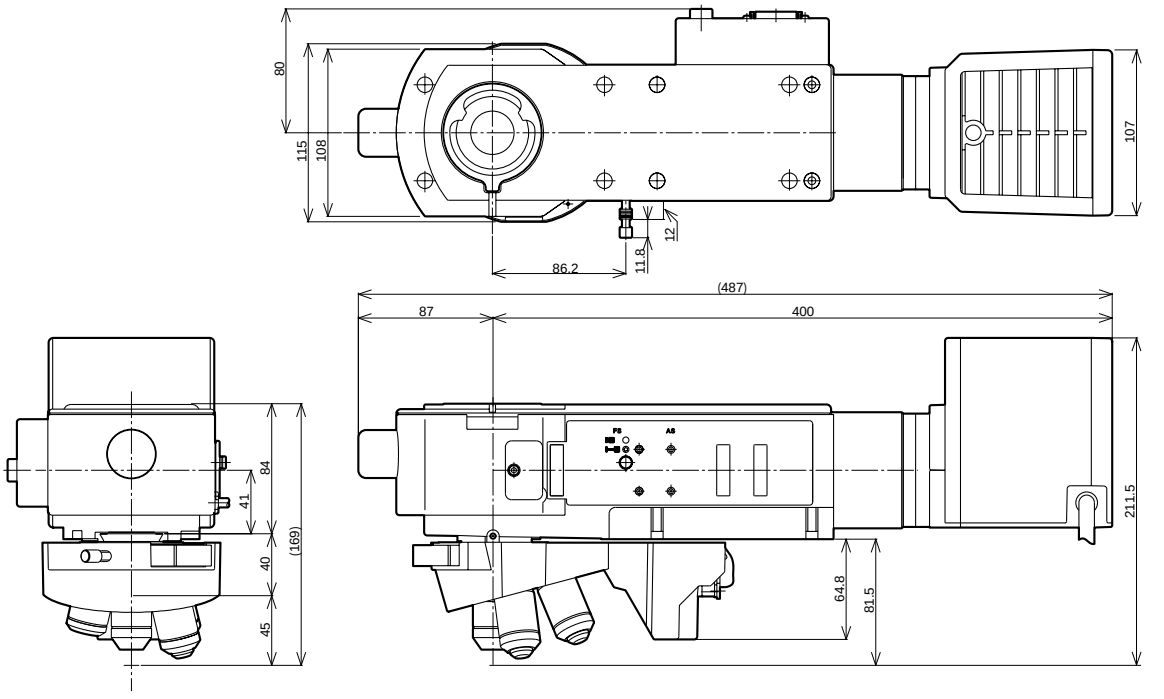
Unit: mm

Motorized units

Enables motorized exchange of illuminator between brightfield, darkfield and objectives as well as closing/opening the aperture diaphragm. The BX-UCB control unit has an RS232C connector, allowing control via a personal computer. For method of attaching illuminator, please refer to D-2.

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

Motorized BF/DF reflected light illuminator+motorized Nomarski DIC sextuple revolving nosepiece+100W halogen lamphousing

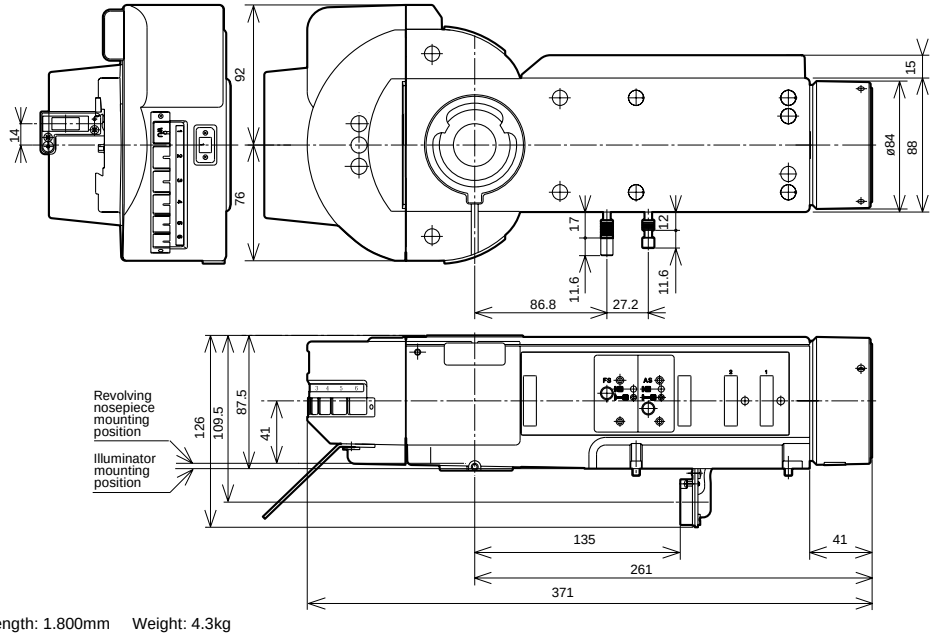


Illuminator cable length: 1.800mm Weight: 5.5kg(exclude objective)

BX-RFAA

Motorized universal reflected light illuminator

Reflected light fluorescence illuminator with simultaneous attachment of six mirror units.
Incorporates motorized mirror unit changeover and shutter.

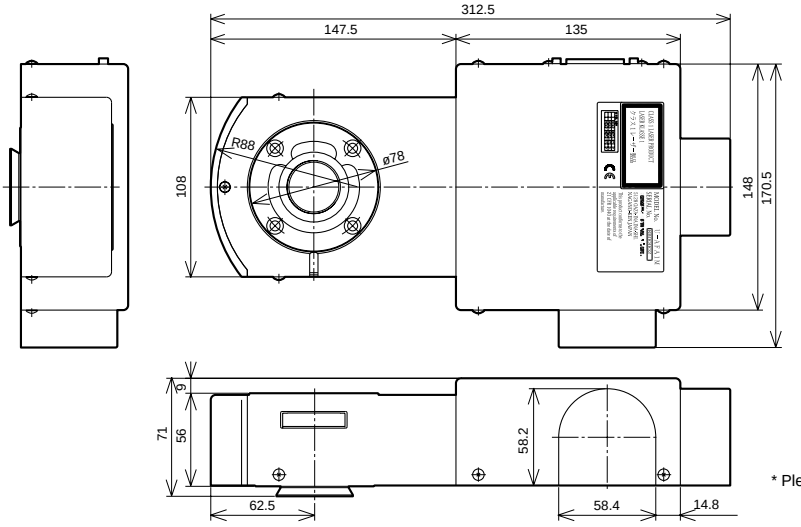


Illuminator cable length: 1.800mm Weight: 4.3kg

Unit: mm

MOTORIZED UNIT

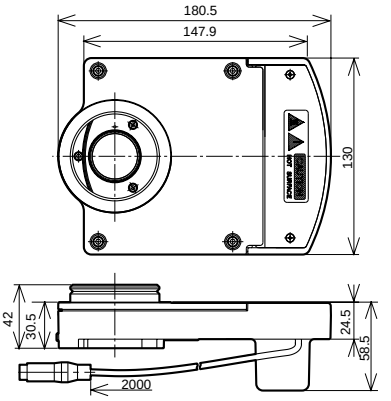
U-AFA1M
Active auto focus unit



Weight: 3.3kg

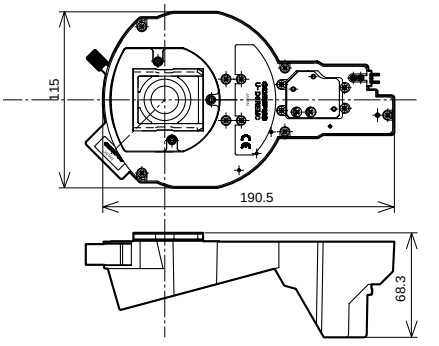
* Please consult your Olympus dealer about the motorized focus.

U-FWR
Motorized reflected filter wheel



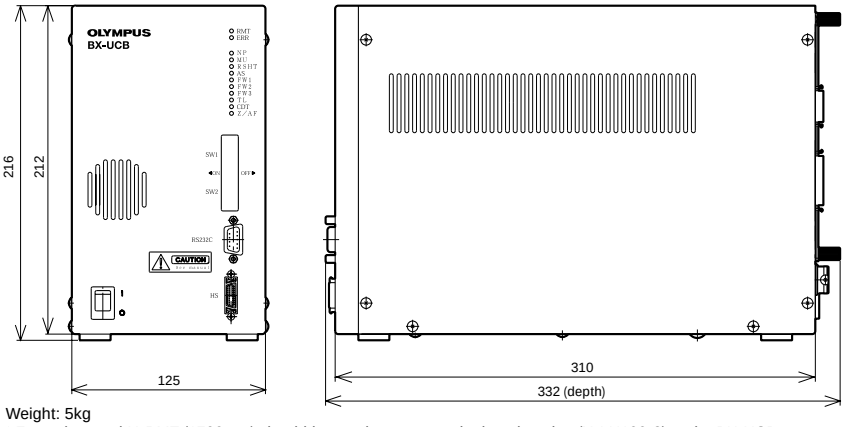
Weight: 1.0kg

U-D5BDREMC/U-D6REMC/U-P5REMC
Motorized quintuple BD revolving nosepiece with slider slot for DIC/
Motorized sextuple revolving nosepiece with slider slot for DIC/
Motorized centerable quintuple revolving nosepiece with slider slot for DIC



Weight: 1.1kg

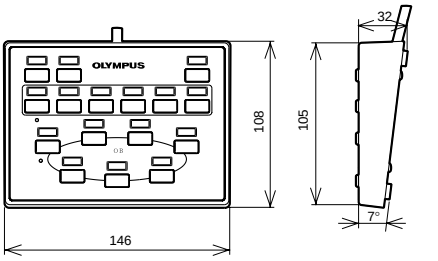
BX-UCB
Control unit



Weight: 5kg

* Extension cord U-RMT (1700mm) should be used to connect the lamphousing (U-LH100-3) to the BX-UCB.

U-HSTR2
Hand switch



Cable length 2000mm

Weight: 370g

Unit: mm

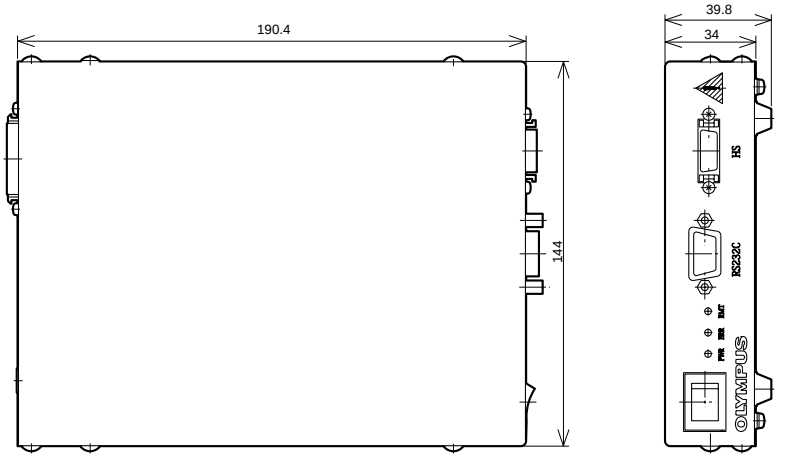
MOTORIZED UNIT

BX-REMCB

Control box for motorized nosepiece and BF/DF illuminator

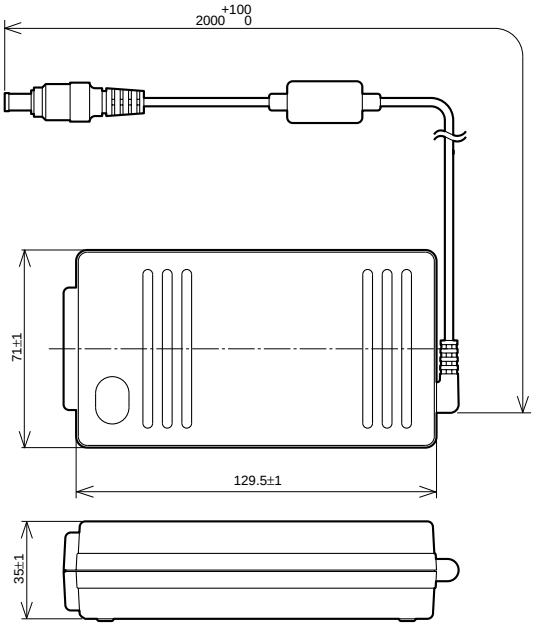
BX-RLAA and U-D5BDREMC/U-D6REMC/U-P5REMC can be controlled from U-HSTR2, or direct from the computer keyboard via an RS232C connector.

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



U-ACAD4515

AC adapter



OPTICAL TERMINOLOGY

1. Field Number (F.N.) and Practical Field of View

The field number (F.N.) is referred to as the diaphragm size of eyepiece in mm unit which defines the image area of specimen. The diaphragm diameter actually seen through eyepiece is known as the practical field of view (D) which is determined by the formula:

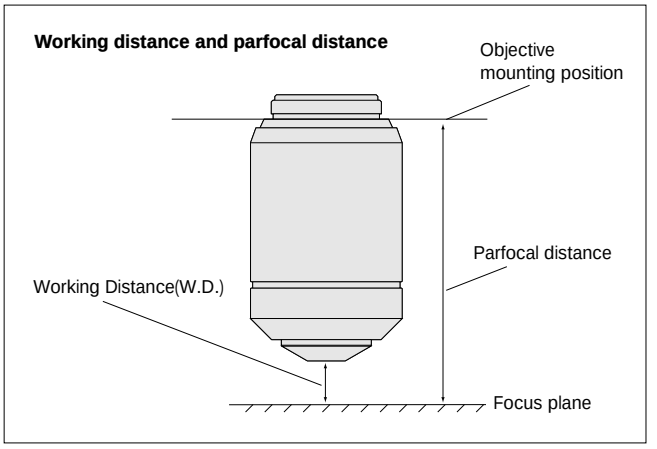
$$D = \frac{\text{Eyepiece F.N.}}{\text{Objective magnification}} \text{ (mm)}$$

2. Working Distance (W.D.)

The distance between the front edge of the objective and the specimen surface (with the surface of the cover glass in case of the cover glass objective) when the specimen is focused.

3. Parfocal Distance

It is the distance between the objective mounting plane and the specimen.
In UIS objectives, the parfocal distance is designed at 45mm.



4. Relationship between the objective's focal length and magnifications

The following formula indicates the relationship between an objective's focal length and magnifications.

$$m_{(ob)} = \frac{\text{Focal length of tube lens}}{f}$$

$m_{(ob)}$: Objective magnification,
f: Objective's focal length
In the UIS optical systems, the focal length of the tube lens is 180mm.

5. Total Magnification

5.1 Observation through eyepiece (binocular observation)

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

$M_{(bino)}$: Total magnification for binocular observation
$m_{(ob)}$: Objective magnification
$m_{(oc)}$: Eyepiece magnification

5.2 Video monitor observation

● Total magnification for video monitor

$$M_{(\text{video monitor})} = m_{(ob)} \times m_{(\text{video camera adapter})} \times \text{Monitor magnification}^*$$

$M_{(\text{video monitor})}$: Total magnification on the video monitor
$m_{(ob)}$: Objective magnification
$m_{(\text{video camera adapter})}$: Projected magnification for video camera adapter including photo eyepiece *(please refer to Figure 1)*

** Please refer to Figure 3 for "Monitor magnification"*

● Practical field of view for video monitor observation

$$\text{Practical field of view for video monitor observation} = \frac{\text{Image device size}^*}{m_{(ob)} \times m_{(\text{video camera adapter})}}$$

$m_{(ob)}$: Objective magnification
$m_{(\text{video camera adapter})}$: Projected magnification for video camera adapter including photo eyepiece *(please refer to Figure 1 for projected magnifications)*

** Please refer to Figure 2 for image device size*

Figure 1 Video camera adapter and projection magnifications

Video camera adapter (Projection lens)	Projection magnifications
U-TVZ	0.5×-1.25×
U-TV1×	1×
U-TV0.5×	0.5×
U-TV0.5×C-3	0.5×
U-TV0.35×C-2	0.35×
U-TV0.25×C	0.25×

Figure 2 Imaging device size

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

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

Figure 3 Imaging device size and monitor magnifications

Camera format	Monitor size (diagonal)				
	9"	12"	14"	20"	27"
1/3"	38.1×	50.8×	59.2×	84.6×	114.1×
1/2"	28.6×	38.1×	44.5×	63.5×	85.7×
2/3"	20.8×	27.7×	32.3×	46.2×	62.3×

Inch↔mm conversion table
1 inch = 25.4mm = 25.4 ×1000 µm
1 mm = 0.03937 inch

Example
What is total magnifications for video monitor when objectives is 50×, video camera adapter U-TV0.5×, 2/3" video camera and 20" video monitor are used ?

•Total magnification on the video monitor:
$m_{(ob)}$=50×, $m_{(video\ camera\ adapter)}$ is 0.5× from Figure 1 and monitor magnification is 46.2× from Figure 3.
$M_{(monitor\ observation)}=m_{(ob)}\times m_{(video\ camera\ adapter)}\times$monitor magnification
=50×0.5×46.2=1155×

•Practical filed of view for video observation(horizontal side):
$m_{(ob)}$=50×, $m_{(video\ camera\ adapter)}$ is 0.5× from Figure 1 and horizontal side of 2/3" imaging device is 8.8mm from Figure 2

$$\text{Practical field of view for video observation} = \frac{\text{Image device size}}{m_{(ob)} \times m_{(video\ camera\ adapter)}}$$

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

6. Numerical Aperture (N.A.)

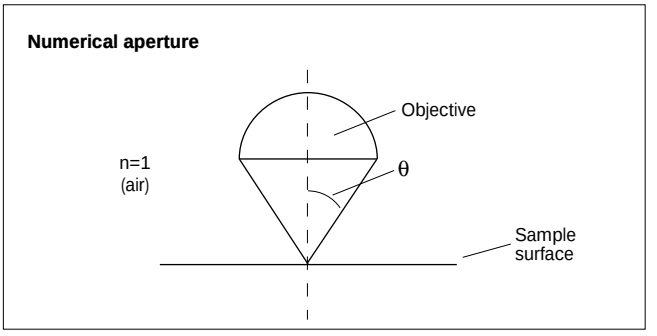
The numerical aperture is a key factor to the performance of objective (resolving power, focal depth and brightness).
The N.A. is determined by the following formula:

$$N.A. = n \times \sin\theta$$

n=Refraction rate of the medium between specimen and objectives. (Air: n=1, oil: n=1.515)
θ: Angle which is 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 N.A. and the lower the objective magnification, brightness will increase in the factor of the second power.

$$B \propto \frac{N.A.^2}{M^2}$$



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 N.A., the higher the resolving power.

● Resolving power formula
The following formula is generally used for determing resolution.

$$\varepsilon = 0.61 \times \frac{\lambda}{N.A.}\ \text{(Reyleigh formula)}$$

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

Example
UMPLFL100×(N.A.=0.95), λ=0.55μm

$$\varepsilon = 0.61 \times \frac{\lambda}{N.A.} = \frac{0.3355}{N.A.} = \frac{0.3355}{0.95} = 0.35\mu m$$

8. Focal Depth

The focal depth refers to the depth of the specimen layer which is in sharp focus at the same time. As human eyes are individually different in the ability of their focus adjustment, each perception of the focal depth varies.
At present, the Berek formula that gives a focal depth value that often coincides with that obtained through experiments is generally used.

● Visual observation (Berek formula)

$$\pm d = \frac{\omega \times 250{,}000}{N.A. \times M} + \frac{\lambda}{2(N.A.)^2}$$

ω: Resolving power of eyes 0.0014
(when optical angle is 0.5 degrees)
M: Total magnification
(objective magnification×eyepiece magnification)

$$\pm d = \frac{350}{N.A. \times M} + \frac{0.275}{N.A.^2}\ (\lambda=0.55\mu m)$$

Example
With UMPLFL100×(N.A.=0.95), WHN10×:

$$\pm d = \frac{350}{0.95 \times 1{,}000} + \frac{0.275}{0.9} = 0.37 + 0.3 = 0.67\mu m$$

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

9. Observation Methods

9.1 Reflected brightfield

It is to observe the light reflected directly from specimen. The light from the illumination lamp is vertically guided through objectives and incident on the specimen. The light reflected from the specimen is observed through the objective.

9.2 Reflected darkfield

It is to observe the scattered or diffracted light forming from the specimen. The light from the lamp travels in ring-form illumination optics equipped in circumference separately from objective and is focused on the specimen.

- ★ Suitable for detection of minute scratches or flaws on specimen and examining mirror surface specimens including wafer.

9.3 Reflected DIC (Differential Interference Contrast)

It is a microscopic observation technique where the height difference of specimen that may not be visible with brightfield become a relief-like or three dimensional image with improved contrast. Illumination light becomes two rays of diffracted light by DIC prism. They bring about slightly difference in light path on height difference of the specimen. The difference becomes contrast utilizing DIC prism and analyzer.
At the sensitive tint range, coloration is enhanced.

- ★ Suitable for examining specimens with very minute height differences including metallurgical structure, minerals, magnetic heads, surface of hard disk and polished surface of wafer.

9.4 Polarized Light

It is a microscopic observation technique with polarized light generated by a set of two filters (analyzer and polarizer). The polarization axes are perpendicular to each other for extinct. Some specimens located between the two filters give characteristic contrast or coloration according to each birefringence property and orientation (i.e. A polished specimen of zinc structure). Polarizer is located in the light path before the vertical illumination, while analyzer is inserted in the observation path before eyepiece.

- ★ Suitable for metallurgical structures (i.e. growth pattern of the graphite on nodular casting iron), minerals and liquid crystal (LCD) and semiconductor materials.

9.5 Reflected fluorescence

This technique is used for specimens emitting fluorescence.

- ★ Suitable for inspection of contamination on wafer, photoresist residues and detection of crack with the usage of fluorescence method.

9.6 IR(Infrared ray)

IR observation is the preferred method of inspecting the inside of electronic devices using materials which transmit IR, like silicon or film. It is especially suitable for inspecting semiconductor substrates, and is widely used in contemporary CSP (chip scale package) research and development programs. IR objectives are also used with the near-infrared ray Raman spectroscope and laser repair purposes using a (1,064nm) YAG laser.

10. Koehler illumination

Light from the primary light source is collected by the collector lens and forms an image at the AS (aperture stop) position. This image acts as a secondary light source, reproducing the image at the objective's exit pupil position and casting telecentric (parallel light) illumination on the specimen surface. This is generally known as "Koehler illumination" and has two main features. One is its brightness and uniformity; the other is that it allows both AS and FS (field stop) settings to be changed independently.

The effect of FS

FS settings adjust the field of view at the extreme periphery and prevent extraneous reflected light from altering the forming light. This effectively eliminates flares from the whole image.

The effect of AS

AS is effective when adjusting the illumination N.A. or changing the image contrast. Generally, the best contrast is obtained by diapharagming the objective pupil diameter to about 80%. However, when using objectives of over 100x magnification, better contrast images are obtained by diapharagming the objective pupil diameter to less than 50%.

MEMO

•OLYMPUS CORPORATION obtains ISO9001/14001.

Specifications are subject to change without any obligation on the part of the manufacturer.

OLYMPUS®

www.olympus.com

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

OLYMPUS LIFE AND MATERIAL SCIENCE EUROPA GMBH
Postfach 10 49 08, 20034, Hamburg, Germany

OLYMPUS SURGICAL & INDUSTRIAL AMERICA INC.
One Corporate Drive, Orangeburg, NY 10962, U.S.A.

OLYMPUS UK LTD.
2-8 Honduras Street, London EC1Y OTX, United Kingdom.

OLYMPUS AUSTRALIA PTY. LTD.
31 Gilby Road, Mt. Waverley, VIC 3149, Melbourne, Australia.

OLYMPUS LATIN AMERICA, INC.
6100 Blue Lagoon Drive, Suite 390 Miami, FL 33126-2087, U.S.A.

Printed in Japan M1570E-0805B