BIOLOGICAL MICROSCOPE

CH10 / CH20

REPAIR MANUAL

OLYMPUS

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REPAIR MANUAL

OLYMPUS

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F. LUBRICANTS AND CHEMICALS

1. Kinds of Product

CH20F Kinds of product

	Names of unit	Contents of unit
1.	CH20BIMF110	Overseas area: 100V system CH20 frame with BI, MVR
2.	CH20BIMF200	Overseas area: 200V system CH20 frame with BI, MVR
3.	CH20MOMF110	Overseas area: 100V system CH20 frame with MO, MVR
4.	CH20MOMF200	Overseas area: 200V system CH20 frame with MO, MVR
5.	CH20BIMF100	Japan: 100V system CH20 frame with BI, MVR
6.	CHMOMF100	Japan: 100V system CH20 frame with MO, MVR
7.	CH20MOF100	Japan: 100V system CH20 frame with MO

CH10F Kinds of product

	Names of unit	Contents of unit
1.	CH10BIMF	Overseas area: CH10 frame with BI, MVR
2.	CH10BIF	Overseas area: CH10 frame with BI
3.	CH10MOMF	Overseas area: CH10 frame with MO, MVR
4.	CH10MOF	Overseas area: CH10 frame with MO
5.	CH10MOMF-D	Japan: CH10 frame with MO, MVR
6.	CH10MOF-D	Japan: CH10 frame with MO

Stage: MVR (mechanical stage) Observation tube: MO (monocular), BI (binocular)

2. Outline

(1) CH20 and CH10 are low-price, economical biological microscopes, which offer an advanced range of functions and specifications required for clinical and educational use.
(2) CH20 and CH10 are LB optical microscopes, which are substitutes up-graded in specifications for the conventional CHK2.
(3) External standard

Electrical safety standard: IEC1010-1, EN61010-1, UL3101-1
Armature emission: EN55011, Group 1, Class B
Immunity: EN550082-1
According to the above standards, we got UL and GS mark and declare CE mark.

3. Features

(1) Main features
- Condenser movement (vertical) by rack and pinion, approx. 10 mm stroke
- Field diaphragm unit (CH3-FS) is available optionally.
- Arm with DS (Direct Sight) window through which specimen can be observed with naked eye from the back.
- Focusing knob which can be controlled while putting your hands on the table.

(2) Illumination is bright because 6V20W halogen lamp is employed.

(3) The dust-proof observation tube keeps off dust and also anti-fungus treatment for it is effective for protecting from fungus.
(4) The handhold enable you to hold the microscope frame easily.
(5) LB objective of 45 mm focal distance is employed.

4. Using Conditions

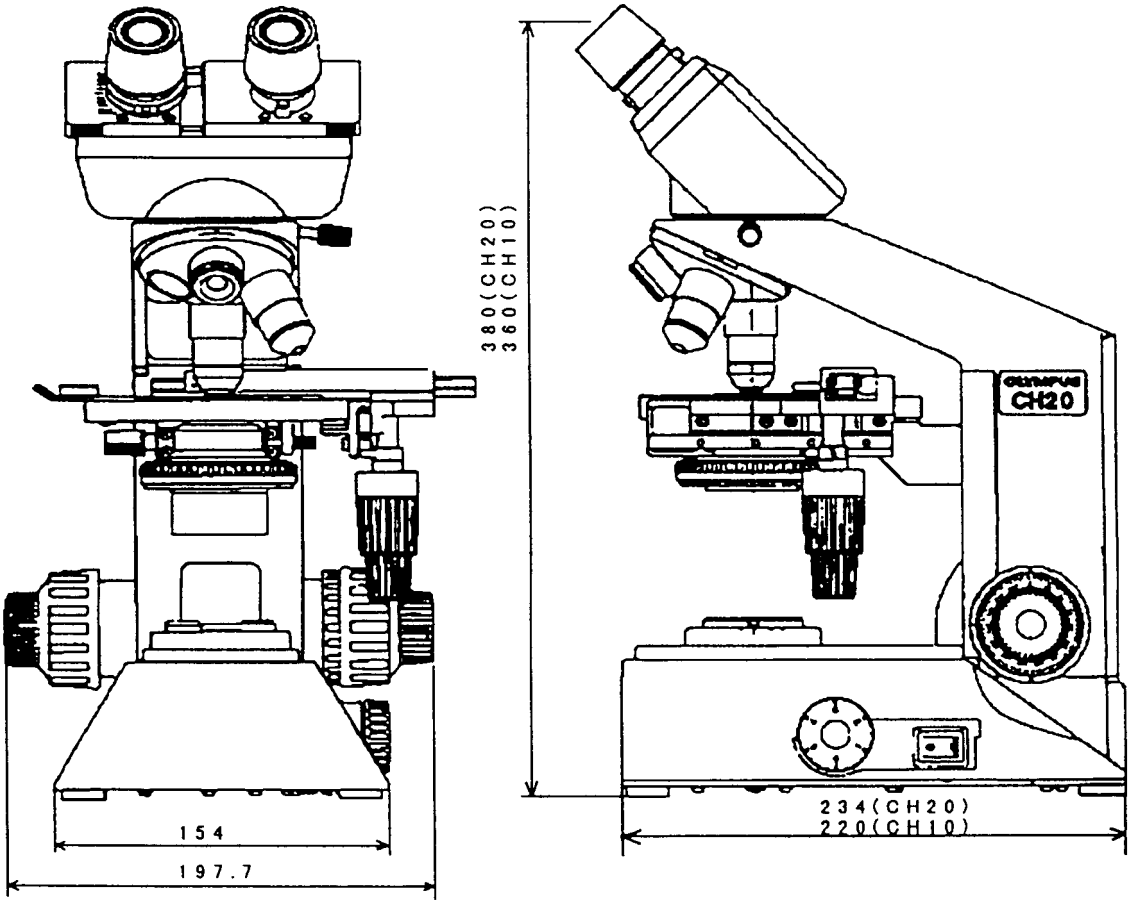
(1) Standard performance cannot be ensured in combination with objectives other than NEA series, PCDA10XPL, PCDA40XPL, and EA60X.
(2) Standard performance cannot be ensured in combination with eyepieces other than NCWHK10X (for binocular/ monocular observation tube) and ER15X (for monocular observation tube).
(3) Intermediate attachment, photomicrographic unit, and TV unit can not be used.
(4) Condenser is provided as a standard, and it is not interchangeable.
(5) Standard performance cannot be ensured in combination with units other than darkfield central stop (CH2-DS), phase contrast attachment (CH2-RS10, RS40), and attachment lens (CH3-AL).
(6) CH2-DS can not be used for objective 4X and 100X.
(7) Field diaphragm unit and attachment lens (CH3-FS, CH3-AL) can be attached optionally. However, use them for objective 40X or less.
(8) When FS and AS are stopped down to the minimum, ghost may occur.
(9) Mechanical stage is not interchangeable.
(10) Micrometer eyepiece cannot be attached to the binocular observation tube.
(11) Operating environment temperature: 5°C - 40°C, humidity: 30 - 80 %
(12) Blue filter (LP5146), which is made from plastic, should not be wiped off with organic detergent.

5. Specifications

Items		Specifications	Remarks
1	Observation tube	1) Circular dovetail type, rotatable for 360° 2) Anti-fungus treatment 3) Eyepiece sleeve diameter: ϕ23.2 mm 4) MO45 inclination angle: 45° 5) BI45 Jentsh type inclination angle: 45°, interpupillary distance adjustment : 53 - 75 mm, left diopter compensation: ±5 Diopter	
2	Revolving nosepiece	1) Fixed quadruple revolving nosepiece (with front side facing upward) 2) Center bearing type Arm and revolving nosepiece integrated (fixed)	
3	Stage	1) Fixed plane stage 2) Fixed mechanical stage (with C20-MVR) 3) Dimensions: 120 × 120 mm	

Items		Specifications	Remarks
		4) Working range ① 40 mm in longitudinal direction ② 76 mm in lateral direction 5) Clip holder (lever type) ・Holding capacity: a standard slide glass (76 × 26 mm) ・Specimen thickness: 0.9 - 1.4 mm ・Inclination form: 30° 6) With biological clip holder (except FM type)	
4	Focusing mechanism	1) Coaxial coarse and fine adjustment knobs 2) Coarse / fine adjustment stroke: 20 mm or more 3) With fine scale: 2.5 μm / graduation 4) Fine adjustment stroke per rotation: 0.3 mm 5) Coarse adjustment knob (with the torque adjustment mechanism) 6) Without coarse adjustment lock mechanism	
5	Condenser holder	1) Dovetail type (Condenser can be attached and removed freely.) 2) Rack and pinion vertical motion, rotating; knob type, stroke: 10 mm or more	
6	Condenser	1) Numerical aperture: N. A. 1.25 (using in immersion oil) 2) Aperture diaphragm: diaphragm diameter; ϕ1.7 - 29 mm 3) Exclusive condenser with dovetail and rack integrated 4) A filter of ϕ32.5 can be attached (CH2-FH). 5) CH2-RS10, RS40 and DS can be attached. 6) CH3-AL can be attached (CH20F only).	Six diaphragm blades Optional Optional Optional
7	Collector lens part	1) CH3-FS can be attached: circular fitting snap type 2) A filter of ϕ45 can be attached.	
8	Light source	1) 6V20W halogen lamp 2) Lamp replacement by opening and closing back cover 3) Built-in transformer, phase control system 4) Dial continuous light intensity control: indicating the position by graduation	Halogen bulb: Philips 7388 (average life-time: 100 H)
9	Filter	Blue filter (KB-P) is attached directly to the lower part of the condenser.	
10	Weight	CH20F: 4.4 kg CH10F: 3.4 kg	at CH10/20BIMF setting
11	Storing case	・Wooden box (CH20) ・Plastic case (CH10)	

6. Dimensions



[Unit: mm]

1. Inspection Items and Methods

1-1 Microscope frame and stage

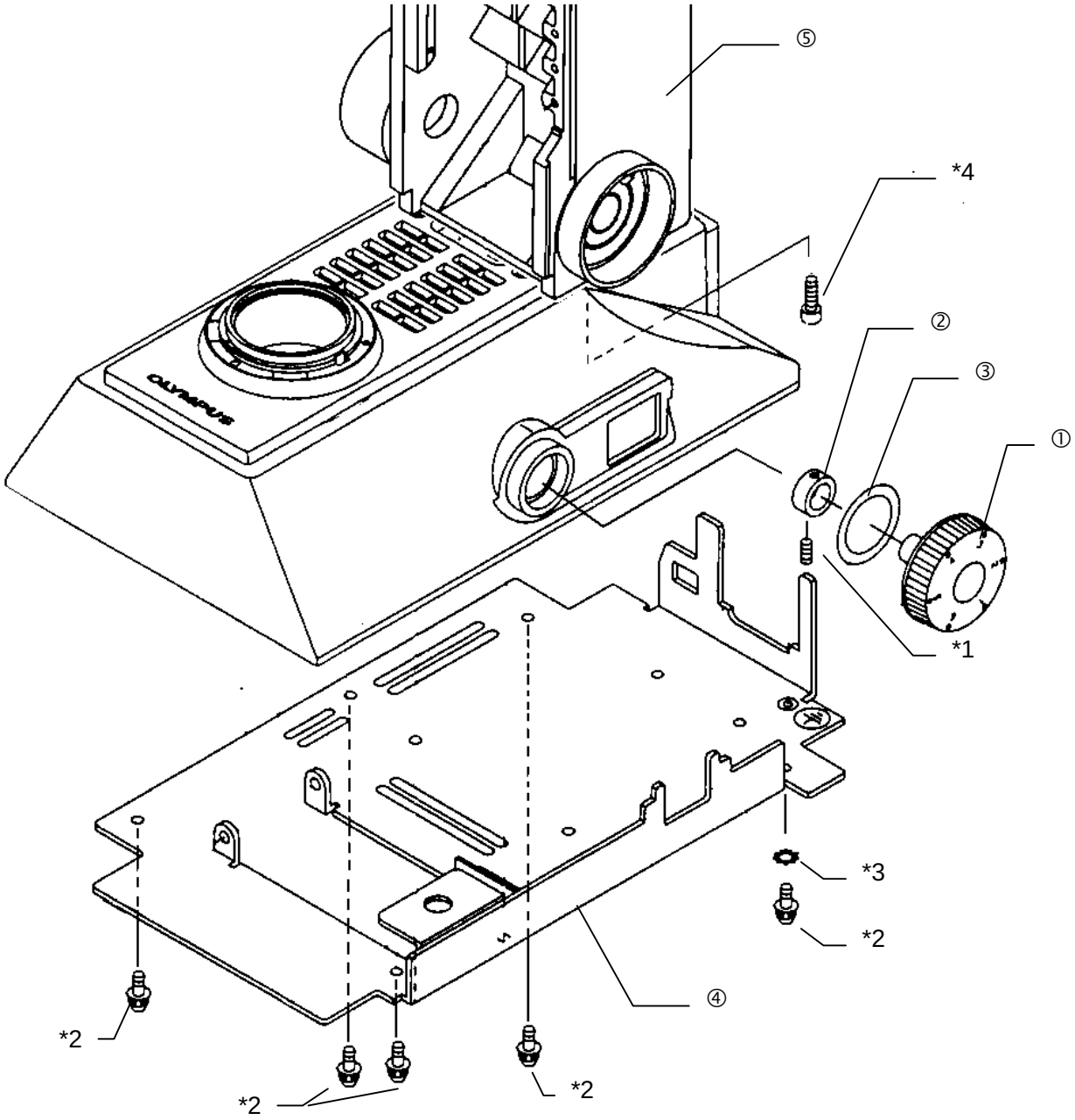
Part	Item	Standard	Method
Illumination	Illumination center	Deviation to optical axis of collector lens: within 10%	Set the centering telescope (KN0029) to the right sleeve, and read the displacement between the optical axis of collector lens and the cross hairs center of centering telescope.
Coarse/fine adjustment	Coarse adjustment knob rotation force	5.9 N {600g} or less	Tie a string around the knob, rotate it to measure the working force with a tension gauge.
	Fine adjustment knob rotation force	0.14 -0.44N {15 - 45g}	
Condenser holder	Condenser knob rotation force	2.5 - 5N {250 - 500g}	Tie a string around the knob, rotate it to measure the working force with a tension gauge.
Revolving nosepiece	Rotation force	0.78 ± 0.57N {80 ± 60g}	Attach an objective to the revolving nosepiece, and measure the rotation force with a tension gauge.
	Click removing force	3.92 ± 1.96N {400 ± 200g}	
Stage	X/Y-knob rotation force	X = 0.2 - 0.98N {20 - 100g} Y = 0.49 - 1.96N {50 - 200g}	Tie a string around the knob, rotate it to measure the working force with a tension gauge.
	Clip holder clearance	Pass through 0.2 mm thickness Stop at 0.7 mm thickness	Measure the clearance between the stage and the clip holder with a thickness gauge.

1-2 Observation tube

Part	Item	Standard	Method
Binocular tube	Interpupillary distance adjustment range	53 mm or less at min. - 75 mm or more at max.	Set the observation state, insert a thin paper with graduations at the eye point position and measure the interpupillary distance.
	Interpupillary distance working force	3.9 - 9.8N {400 - 1000g}	Tie a string around the sleeve periphery, work the interpupillary distance to measure the working force with a tension gauge.
Diopter difference compensation	Compensation range	±5 diopter	Turn the diopter ring and check that the scale goes over the limit.
Optical axis	Left/right optical axis	On image surface: 0.15 mm or less in vertical direction 0.15 mm or less in outward direction 0.3 mm or less in inward direction	Observe a specimen whose center can be identified (e.g., on concentric circles) using the standard eyepiece (KN0048; with adapter-1) and 4X or 10X objective. Align the center of specimen with that of visual field in the right sleeve as the standard, and read the displacement between centers of the specimen and the visual field in the left sleeve using the reticle scale (1 graduation is 0.1 mm.) of KN0048.
	Absolute optical axis (right sleeve only)	0.3 mm or less on image surface	Set the interpupillary distance to 62 mm, combine the standard eyepiece (KN0048; with adapter-1), the microscope frame (product) and the standard objective (KN0015), and read the displacement between centers of the specimen and the visual field in the right sleeve using the reticle scale of KN0048.
	Exit pupil center	Within 20% of objective's exit pupil diameter	Combine the centering telescope (KN0029), 4X or 10X objective, and the microscope frame (product), and read the displacement between the objective's exit pupil diameter center and the cross hairs center of centering telescope.
Tube length	Absolute parfocality	±0.5 mm or less on image surface	Combine the standard eyepiece (KN0048; with adapter-1), the focusing telescope (FT-36), the microscope frame (product), and the standard objective (KN0016). Set the interpupillary distance to 62 mm, and read the parfocality difference between the reticle in KN0048 (with adapter-1) and the specimen in KN0016 using helicoid scale (1 graduation is 0.1 mm.) of KN0048.

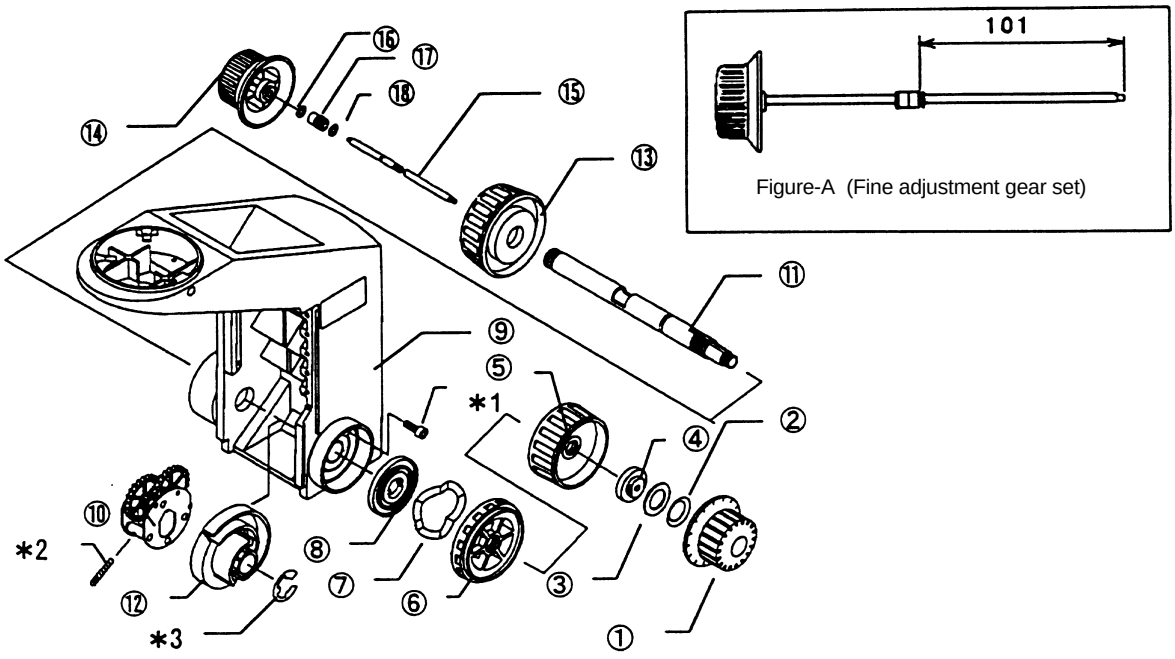
1. Focusing Unit

1-1 Base plate and arm



No.	Parts name	Screw	Grease	Adhesive	Remarks
①	DAIAL				
②	PLATE	ACU3X4SA (*1)			
③	WASHER		OT2008		
④	BASE PLATE	CUKSK3X6SA (*2) 5 pcs. HWB3SB (*3)			Remove the base plate, opening the lamp cover.
⑤	ARM	AB5X12SA (*4) 3 pcs.			

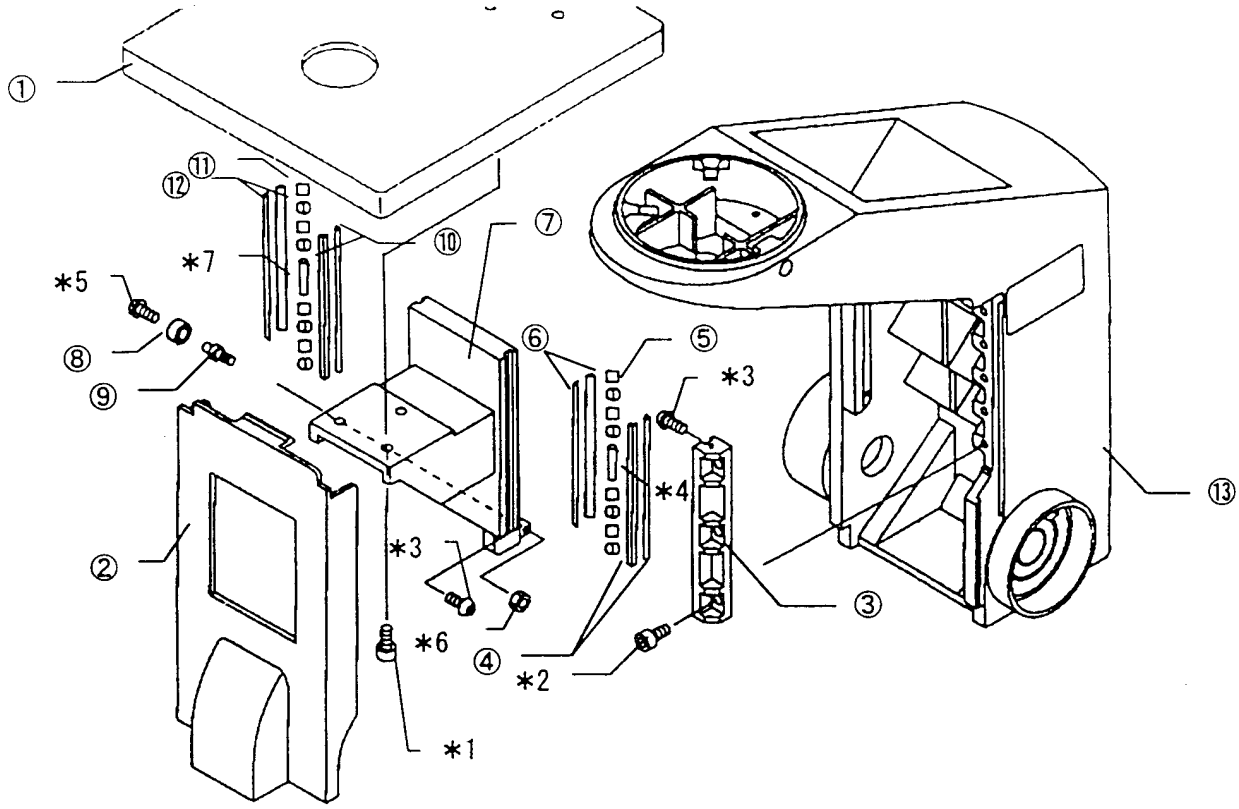
1-2 Coarse / fine adjustment knob



No.	Parts name	Screw	Grease	Adhesive	Remarks
①	FINE ADJ. KNOB			OT1131	Apply adhesive on the attaching part of fine adj. shaft ⑮.
②	SPRING WASHER		OT2008		With the convex side toward the arm
③	WASHER		OT2008		
④	FINE SHAFT MOUNT				
⑤	COARSE ADJ. KNOB-R				
⑥	TENSION KNOB		OT2006		Apply grease on M20 screw thread.
⑦	SPRING		OT2006		Apply grease on the contact points of spring.
⑧	TENSION RING		OT2006		Apply grease on the groove.
⑨	ARM	AB3X14SA (*1)			
⑩	(GEAR ASS'Y)	ACU3X14SA (*2)			Tighten the screw 45° after the screw end comes in contact with the coarse adj.shaft ⑪.
⑪	COARSE ADJ. SHAFT	ER12SA (*3)		OT1028	Apply adhesive on the screw thread of coarse adj. knob ⑬.
⑫	CAM		OT2008		Apply grease on the cam sliding surface and the fitting surface of coarse adj. shaft ⑪.

⑩	GEAR ASS'Y				Insert the gear ass'y ⑩ into the groove of coarse adj.shaft ⑪ and engage the big gear A at the right side with the gear inside of the cam ⑫.
⑬	COARSE ADJ. KNOB-L				
⑭	FINE ADJ. KNOB			OT1028	Apply adhesive on the screw thread of fine adj. shaft ⑮.
⑮	FINE ADJ. SHAFT		OT2008		Apply grease on the sliding surface.
⑯	RING				
⑰	FINE ADJ. GEAR				Press in to 101 mm from the end of the fine adj. shaft ⑮. See Figure-A on previous page.
⑱	RING				

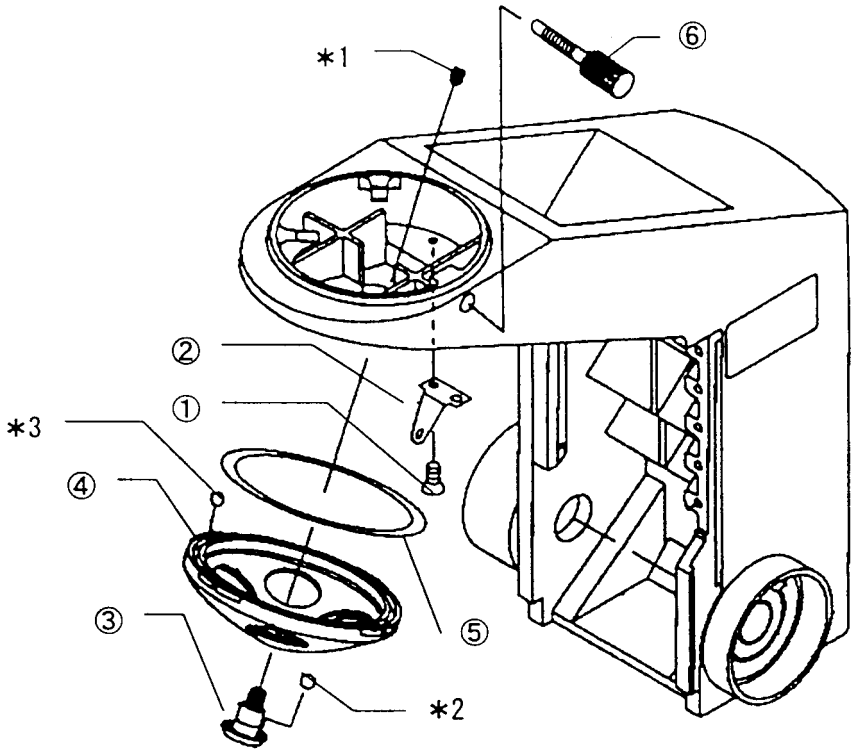
1-3 Guide unit



No.	Parts name	Screw	Grease	Adhesive	Remarks
①	STAGE	AB3X8SA (*1) 3 pcs.			
②	FRONT COVER				Remove the base. (See C-1.)
③	OUTER GUIDE	AB3X12SA (*2) 3 pcs. CUTB2X4SA (*3) 2 pcs.	OT2008		Apply grease on the fitting surface of wire guide ④ thinly.
④	WIRE GUIDE (2 pcs.)		OT2008		
⑤	ROLLER (8 pcs.)	NP2.5X22UO (*4)			
⑥	WIRE GUIDE (2 pcs.)		OT2008		
⑦	INNER GUIDE	CUTB2X4SA (*3) 2 pcs.	OT2008		
⑧	BEARING	3PUK2X3SA (*5)			
⑨	SHAFT	6N3SA (*6)		OT1028	Apply adhesive on the M2 tap hole and the outside diameter of screw.
⑩	WIRE GUIDE (2 pcs.)		OT2008		

11	ROLLER (8 pcs.)	NP2.5X22UO (*7)			
12	WIRE GUIDE (2 pcs.)		OT2008		
13	ARM		OT2008		Apply grease on the fitting surface of wire guide 12. Inner guide working force: 1 - 1.5 N {100 - 150 g}

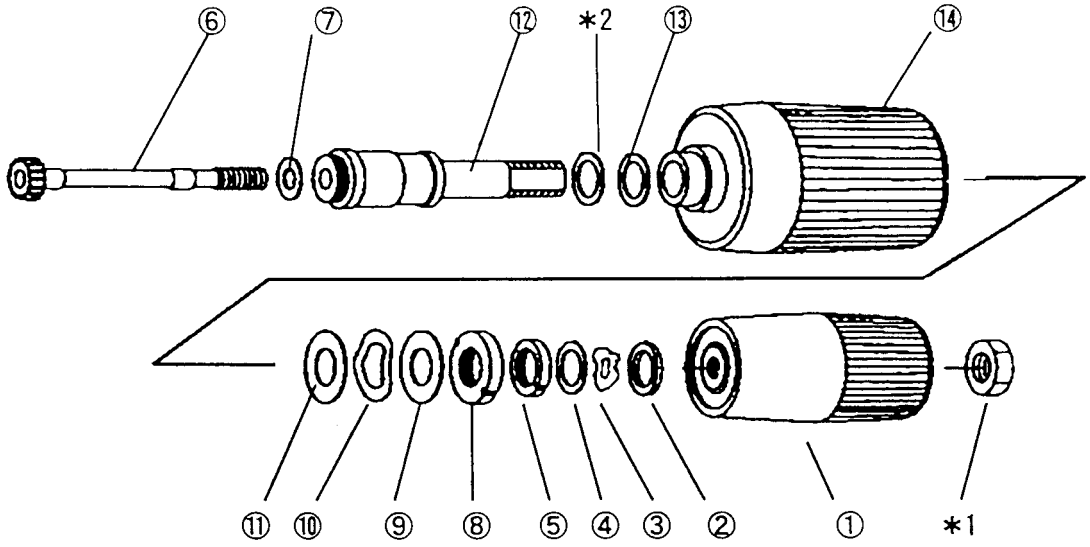
2. Revolving Nosepiece



No.	Parts name	Screw	Grease	Adhesive	Remarks
①	SCREW				
②	NOSEPIECE SPRING				Absolute optical axis: within 0.3 mm Click removing force: 6.4 - 8.8N {650 - 900g} Optical axis adjustment of revolving nosepiece (See Repair Procedure, D-1.)
③	SHAFT	ANU5X6SA (*1) B3SO (*2) 10 pcs.	OT2008	OT1028	Apply grease on the balls (B3SO) fitting surface. Apply adhesive on the screw thread.
④	NOSEPIECE	B3SO (*3) 66 pcs.	OT2008		Apply grease on the balls (B3SO) fitting groove.
⑤	RING				
⑥	KNOB		OT2008		Apply grease on the screw thread.

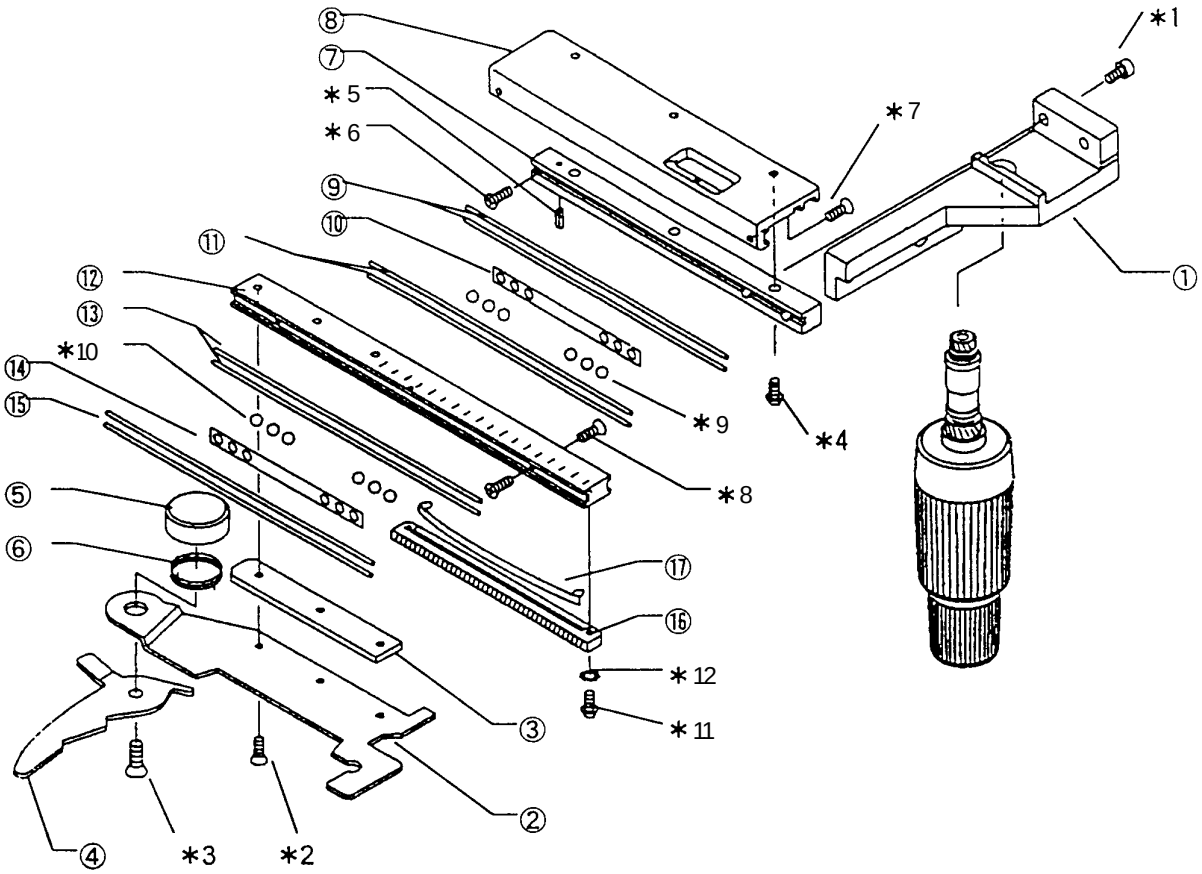
3. Stage

3-1 X/Y-knob ass'y



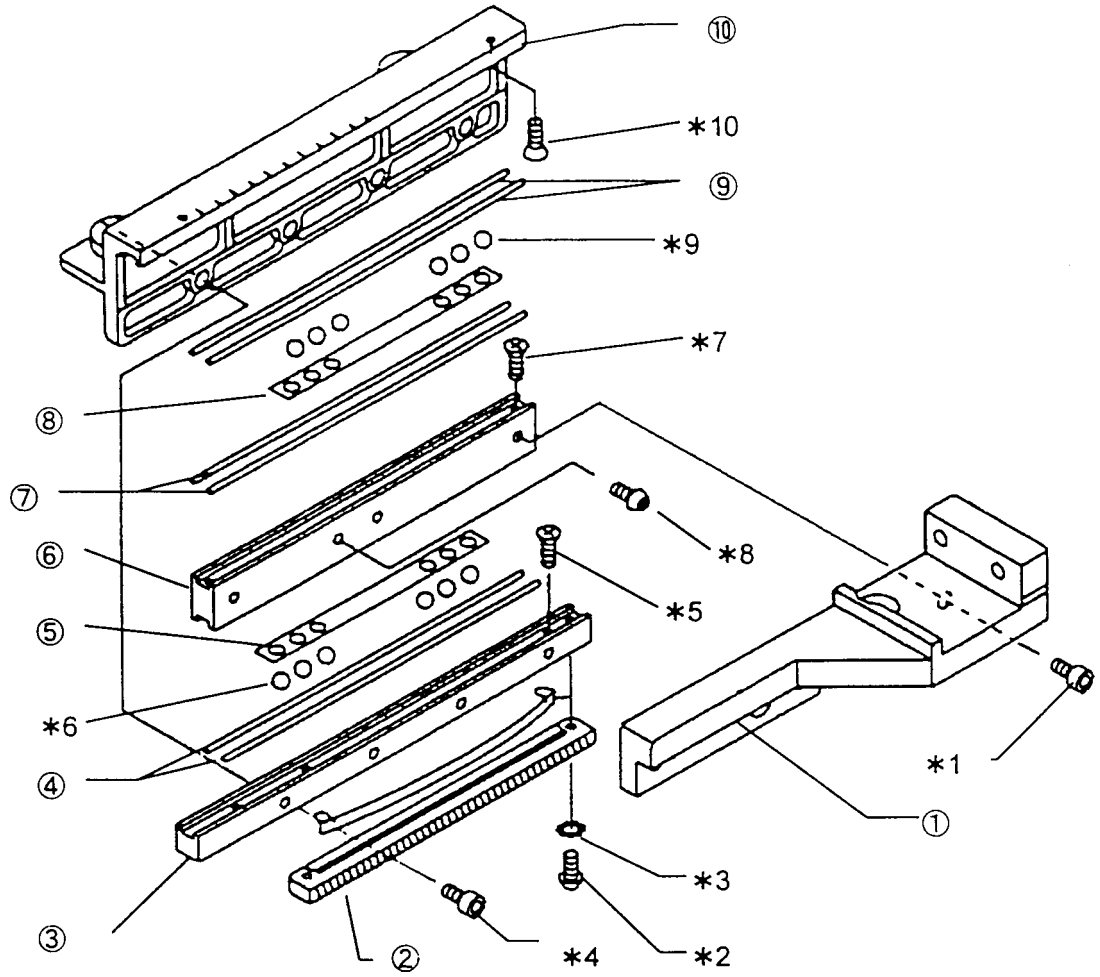
No.	Parts name	Screw	Grease	Adhesive	Remarks
①	X-KNOB	6N4SA (*1)		OT1131	Apply adhesive on the nut. Rotation force: 0.4±0.1N {50±10g}
②	WASHER		OT2008		
③	SPRING WASHER		OT2008		
④	WASHER		OT2008		
⑤	NUT				
⑥	PINION		OT2008		Apply grease on the fitting surface with Y-knob ‡M.
⑦	WASHER		OT2008		
⑧	NUT				
⑨	WASHER		OT2008		
⑩	SPRING WASHER		OT2008		
⑪	WASHER		OT2008		
⑫	METAL			OT1028	Apply adhesive on the fitting screw of body①. (See C-9.)
⑬	WASHER	NW7.2-412BO (*2)	OT2008		
⑭	Y-KNOB				Rotation force: 1.1 - 1.2N {110 - 120g}

3-2 X-guide unit and stage clip holder



No.	Parts name	Screw	Grease	Adhesive	Remarks
①	BODY	AB3X8SA (*1) 2 pcs.		OT1028	Apply adhesive on the assembly surface for lateral guide-1⑧.
②	CLIP HOLDER	3PUK2X8SA (*2) 3 pcs.		OT1131	Apply adhesive on the screw head. Clearance between the stage and the clip holder: 0.2 - 0.7 mm
③	SPACER				Mount the spacer with the round edge side faced downwards.
④	CLIP	CSK3X8SA (*3)	OT2008		Apply grease on the contact surface with the clip holder ②.
⑤	NUT		OT2008		Apply grease on the contact surface with the clip holder ②.
⑥	SPRING		OT2008		Clip working force: 1.0 - 1.5N {100 - 150 g}
⑦	LATERAL GUIDE-3	3PUK2. 6X10SA (*4) 3 pcs. SP1.6X4UO (*5) PSTB1. 7X3SA (*6) 2 pcs.		OT1131	Apply adhesive on the screw head.
⑧	LATERAL GUIDE-1	PSTB1. 7X3SA (*7) 2 pcs.	OT2008		Apply grease on the fitting surface of wire guide ⑮ thinly.
⑨	WIRE GUIDE (2 pcs.)		OT2008		
⑩	CASING	B3SO (*9) 6 pcs.	OT2008		Apply grease on the balls.
⑪	WIRE GUIDE (2 pcs.)		OT2008		
⑫	LATERAL GUIDE-2	PSTB1. 7X3SA (*8) 4 pcs.			Apply grease on the wire guide fitting surface thinly. Rotation force at assembling the X/Y-knob: 0.2 - 0.98N {20 - 100 g}
⑬	WIRE GUIDE (2 pcs.)		OT2008		
⑭	CASING	B3SO (*10) 6 pcs.	OT2008		Apply grease on the balls.
⑮	WIRE GUIDE (2 pcs.)		OT2008		
⑯	X-RACK	3PUK2X6SA (*11) 2 pcs. HWB2SA (*12) 2 pcs.		OT1131	Apply adhesive on the screw head.
⑰	SPRING				

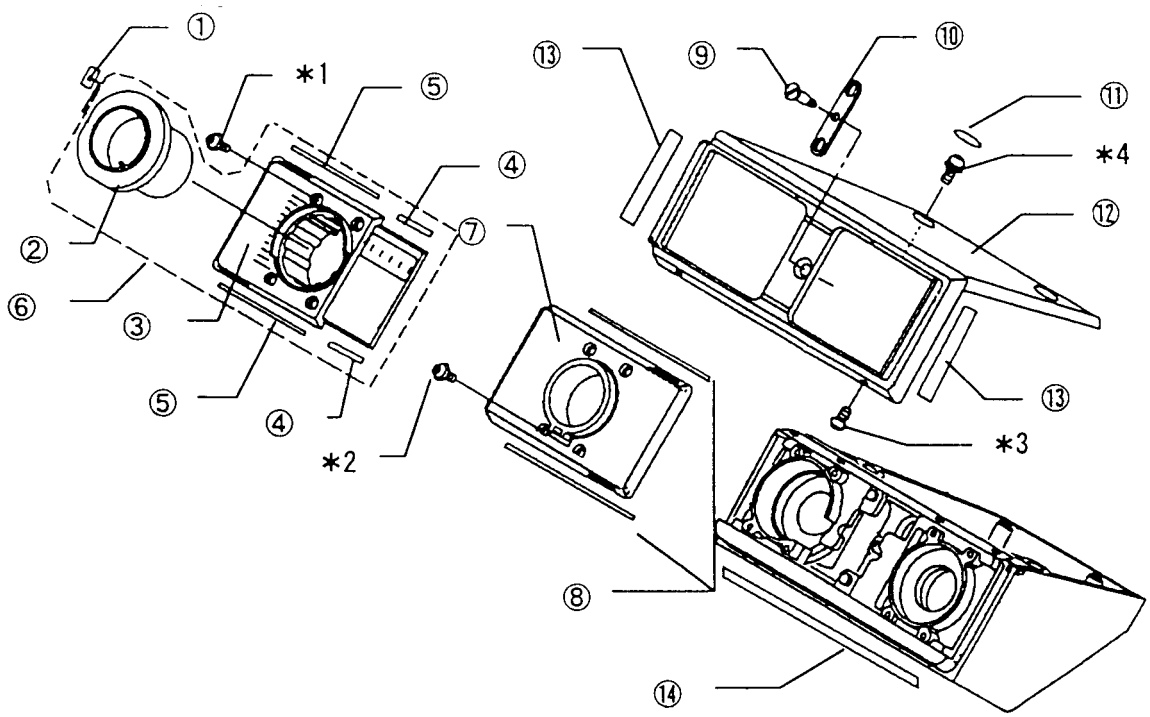
3-3 Y-guide unit



No.	Parts name	Screw	Grease	Adhesive	Remarks
①	BODY	AB3X10SA (*1) 3 pcs.			
②	Y-RACK	3PUK2X6SA (*2) 2 pcs. HWB2SA (*3) 2 pcs.		OT1131	Apply adhesive on the screw head.
③	VERTICAL GUIDE-3	AB3X10SA (*4) 4 pcs. PSTB1. 7X3SA (*5) 2 pcs.			Apply grease on the fitting surface of wire guide ④ thinly.
④	WIRE GUIDE (2 pcs.)		OT2008		
⑤	CASING	B3SO (*6) 6 pcs.	OT2008		Apply grease on the balls.
⑥	VERTICAL GUIDE-2	CUK3X8SA (*8) PSTB1. 7X3SA (*7) 4 pcs.	OT2008		Apply grease on the fitting surface of wire guide ⑦ thinly. Rotation force at assembling the X/Y-knob: 0.49 - 1.96N {50 - 200 g}
⑦	WIRE GUIDE (2 pcs.)		OT2008		
⑧	CASING	B3SO (*9) 6 pcs.	OT2008		Apply grease on the balls.
⑨	WIRE GUIDE (2 pcs.)		OT2008		
⑩	VERTICAL GUIDE-1	PSTB1. 7X3SA (*10) 2 pcs.	OT2008		Apply grease on the fitting surface of wire guide ⑨ thinly.

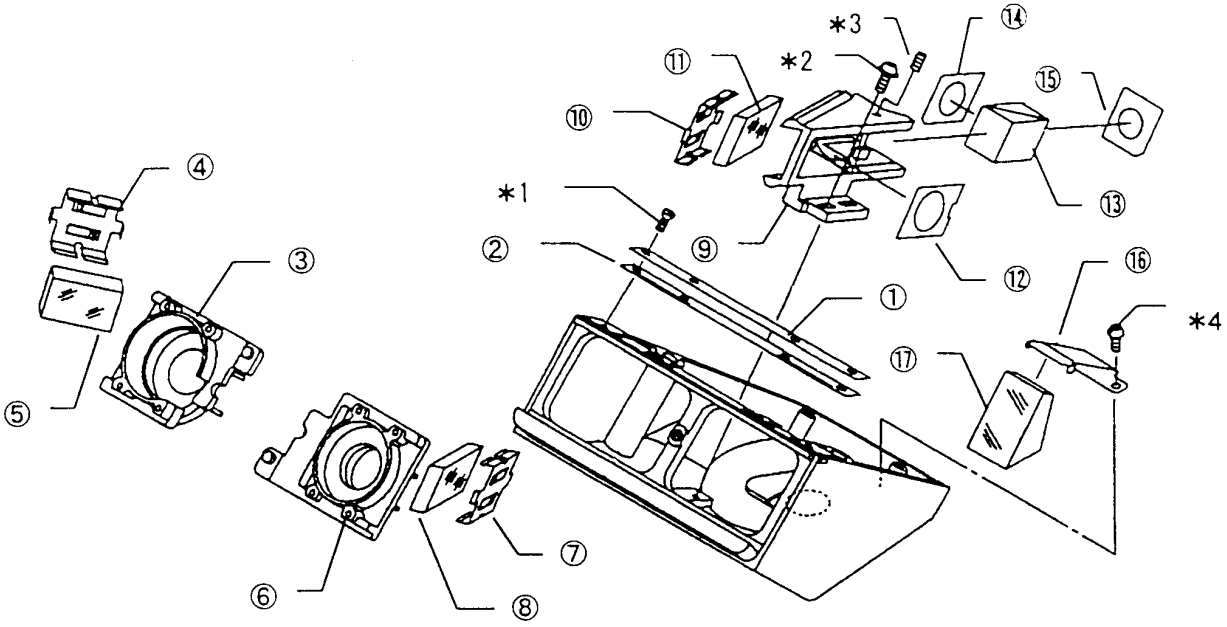
4. Observation Tube

4-1 Sleeves and cover



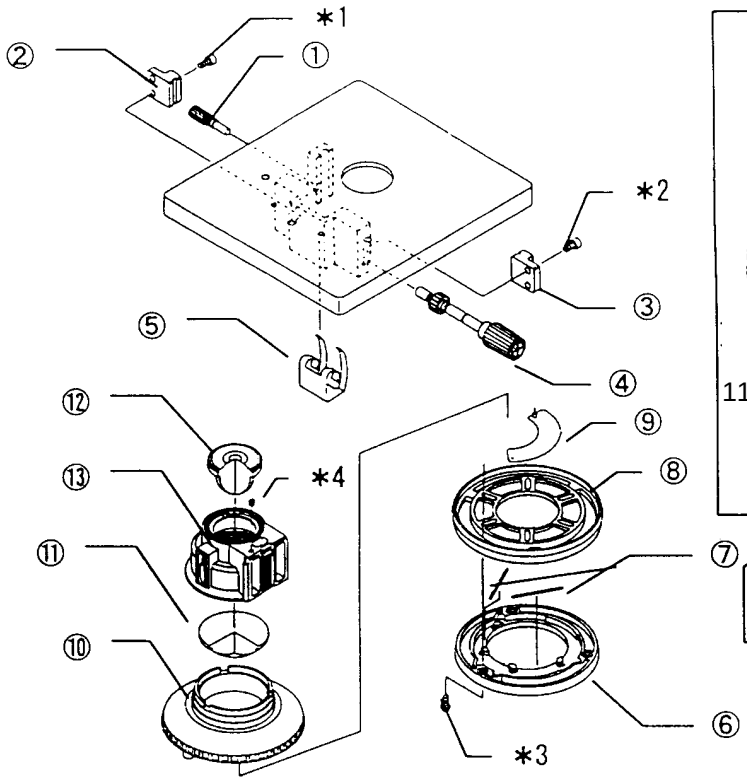
No.	Parts name	Screw	Grease	Adhesive	Remarks
①	DIVISION PLATE				Parfocality adjustment (See Repair procedure, D-4.)
②	SOCKET				Apply grease on the sliding surface of socket②.
③	L-SLEEVE		OT1892		
④	SEAL (2 pcs.)				
⑤	SEAL (2 pcs.)				
⑥	HELICOID ASS'Y	CUKK2X6SB (*1) 4 pcs.			
⑦	R-SLEEVE	CUKK2X6SB (*2) 4 pcs.			
⑧	SEAL (2 pcs.)				
⑨	SHAFT				
⑩	LEVER		OT2008		Apply grease in the inside diameters of three holes.
⑪	SEAL (2 pcs.)				
⑫	COVER	3PUK2X4SA (*3) 2 pcs. CUKSK3X6SA (*4) 2 pcs.			
⑬	SEAL (2 pcs.)				
⑭	SEAL				

4-2 Prism ass'y and mirror ass'y



No.	Parts name	Screw	Grease	Adhesive	Remarks
①	DOVETAIL PLATE	CSK3X5SA (*1) 4 pcs.			
②	DOVETAIL SPRING				Assemble the bent side of the dovetail spring inwards.
③	MIRROR FRAME		OT2008		Apply grease on the dovetail sliding surface. Working force: 3.9 - 9.8N {400 - 1000g}
④	MIRROR SPRING				
⑤	MIRROR				
⑥	MIRROR FRAME		OT2008		Apply grease on the dovetail sliding surface. Working force: 3.9 - 9.8N {400 - 1000g}
⑦	MIRROR SPRING				
⑧	MIRROR				
⑨	MIRROR FRAME	CUKK3X6SA (*2) 2 pcs.			Left/right optical axis adjustment (See Repair procedure, D-4.)
⑩	MIRROR SPRING				
⑪	MIRROR				
⑫	DIAPHRAGM				
⑬	PRISM ASS'Y	AHU3X4SA (*3)		OT1873	Fill the clearance of prism fitting part with adhesive. Apply a small amount of adhesive on the screw.
⑭	DIAPHRAGM				
⑮	DIAPHRAGM				
⑯	PRISM SPRING	CUK3X4SA (*4) 2 pcs.			
⑰	PRISM				Assemble the prism evenly on both sides.

5. Condenser



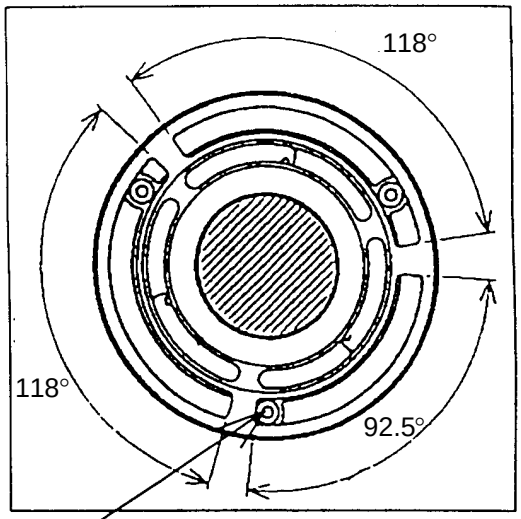
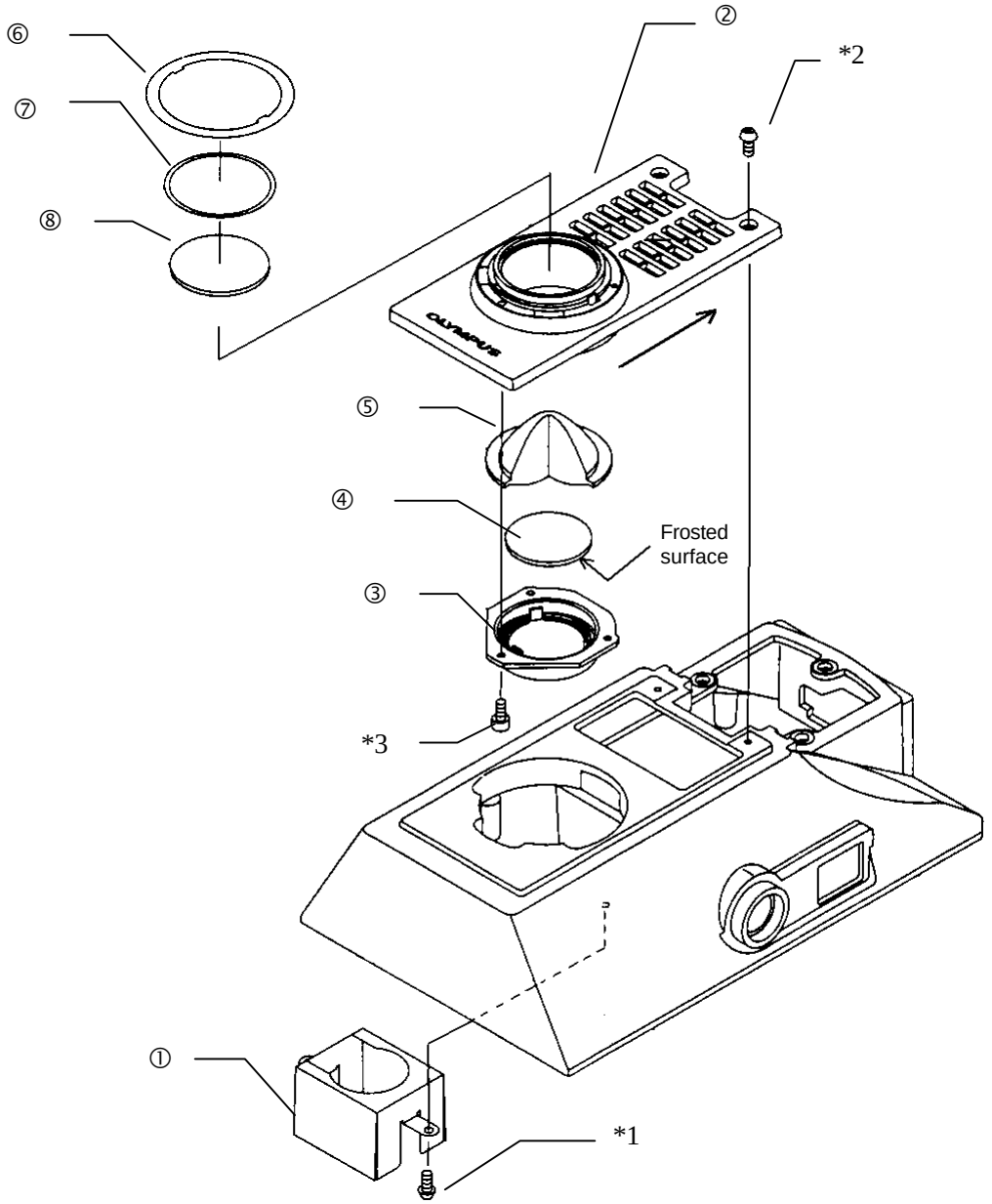


Figure-A (Showing the assembly of lower frame and rotary ring)

Attach the lower frame (AD1994) at the position in which the left end of minimum groove (width; 92.5°) in the rotary ring comes in contact with the boss on the lower frame.

No.	Parts name	Screw	Grease	Adhesive	Remarks
①	STOPPER				
②	DOVETAIL	AB3X8SA (*1) 2 pcs.	0T2008		Apply grease on the dovetail.
③	DOVETAIL	AB3X8SA (*2) 2 pcs.	0T2008		Apply grease on the dovetail. Mount the lens frame ⑬ and tighten the screws (*2) so that the dovetail ③ is attached without play.
④	KNOB		0T2008		Apply grease on the shaft sliding surface.
⑤	PINION SPRING		0T2008		Apply grease on the spring sliding surface.
⑥	LOWER FRAME	CUTB3X6SA (*3) 3 pcs.			See Figure-A.
⑦	SPRING				
⑧	ROTARY RING		0T2008		Apply a small amount of grease on the upper frame boss sliding surface.
⑨	DIAPHRAGM BLADE (6 pcs.)				
⑩	UPPER FRAME				
⑪	LENS				Assemble the lens with the convex side downwards. Clean the lens using alcohol.
⑫	LENS			0T1873	Assemble the lens with the convex side downwards. Clean the lens using alcohol. Apply adhesive between the lens frame and lens groove.
⑬	LENS FRAME	AHU3X4SA (*4)		0T1338	Apply adhesive on the screw (AHU3X4SA) after setting the stage height (-0.1 - 0.15 mm from stage surface to condenser's top end).

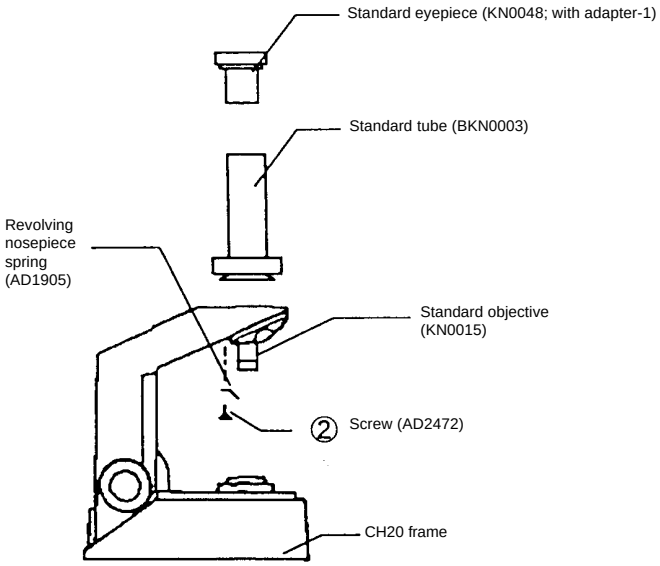
6. Collector Lens Part



No.	Parts name	Screw	Grease	Adhesive	Remarks
①	LAMP COVER	CUK3X4SA (*1) 2 pcs.			With directional properties.
②	BASE COVER	CUK3X6SB (*2) 2 pcs.			Move the base cover within screw play in the direction of arrow.
③	FILTER FRAME	AB3X8SA (*3) 3 pcs.			With directional properties.
④	GLASS			OT1873	Attach the glass to the filter frame ③ at three points where adhesive is applied. (With the frosted surface downwards.)
⑤	LENS				Clean the lens using ether.
⑥	HOLE COVER				
⑦	WASHER				
⑧	GLASS				Without directional properties.

1. Centering of Optical System and Voltage Adjustment

1-1 Optical axis adjustment of revolving nosepiece



・Set the jigs as shown in the left figure.
・Turn on the power of the microscope frame, loosen two SCREWS ②, and adjust the position of the REVOLVING NOSEPIECE SPRING ① to meet the standard.

Standard	Within 3 graduations

1-2 Illumination center adjustment

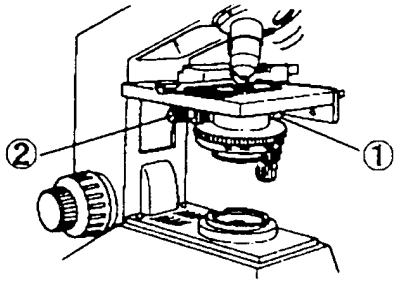


Figure-1

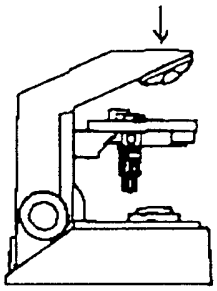
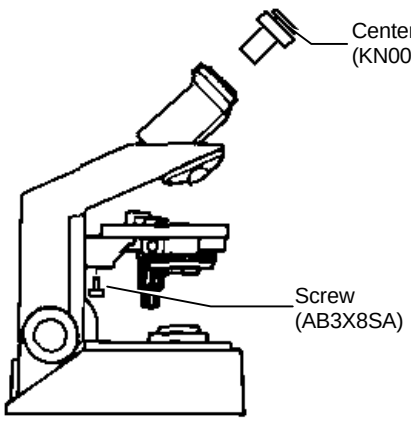


Figure-2

・Turn the KNOB ① of condenser counter-clockwise, and remove the condenser by moving it downwards with the ADJUSTMENT KNOB ②. Figure-1
・Turn on the power of the frame.
・Look through the collector lens from the hole for mounting the objective.
・Make sure that the brightest filament seen through the collector lens is in the center of the hole for mounting the objective. Figure-2 (When it is displaced, adjust the position of the lamp holder.)

1-3 Condenser center adjustment



・Set the jig as shown in the left figure.
・Focus on the collector lens with the centering telescope (KN0029).
・Loosen the three screws (AB3X8SA) securing the stage, and adjust the position of the stage so that the contour of the collector lens can meet the standard.

Standard	Within 20%

1-4 Voltage adjustment

・When variable resistance (KR431400) and transformer (DL150400, DL150500) are replaced, it is necessary to adjust the minimum voltage. The adjustment procedures are as follows:
・Setup
Tools required: digital multimeter

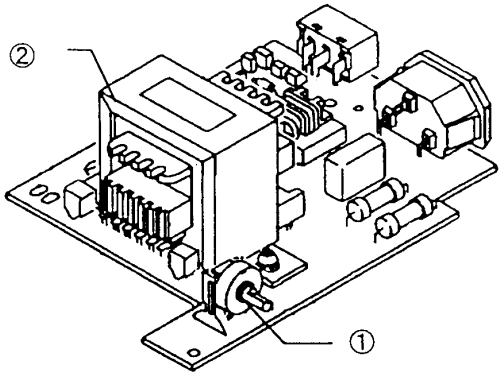


Figure-A

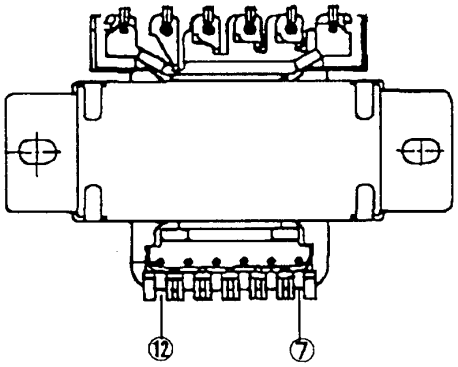


Figure-B

i. Turn on the power, and fully turn the VARIABLE RESISTANCE (KR431400) ① counterclockwise so that the brightness of lamp can be minimum. (Figure-A)
ii. Measure AC voltage at the terminals, ⑦ and ⑫, of the TRANSFORMER②. (Figure-B)
(In 100V system, measure it after selecting the frequency of slide switch S101.)
iii. In 100V system, adjust the voltage with R107 trimmer for 50 HZ, with R109 trimmer for 60 HZ, and in 200V system, with R107 trimmer so that the minimum voltage can meet the standard. (Figure-C, D)

Standard	1.4 - 1.5V

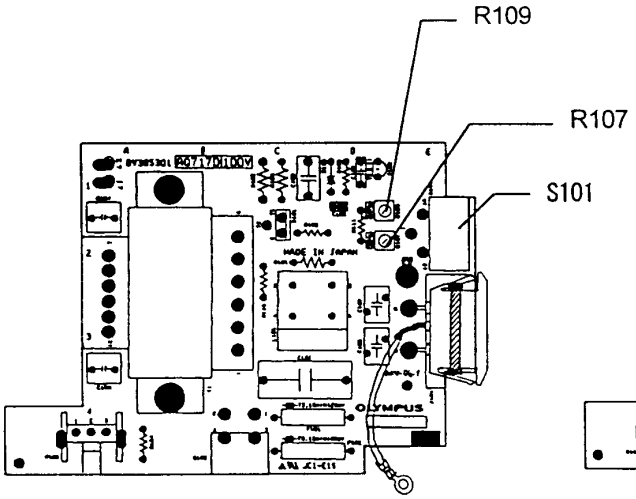


Figure-C (100V system)

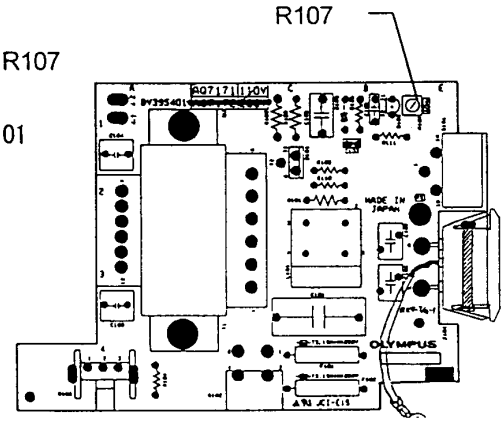


Figure-D (200V system)

2. Observation Tube (C20-BI45) Adjustment

2-1 Adjustment procedure

1. Preparations
   (See 2-2 Preparations, D-3.)

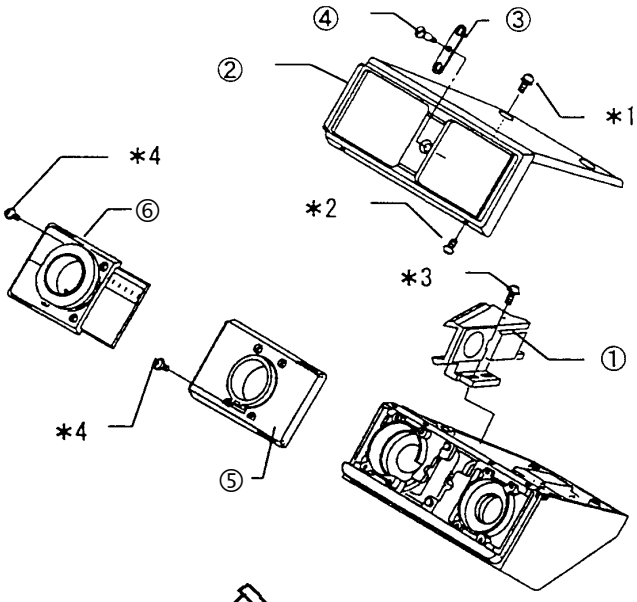
↓

2. Left / right optical axis adjustment, parfocality adjustment
   (See 2-3 Left / right optical axis, parfocality adjustment, D-4.)

↓

3. Exit pupil center check
   (See 2-4 Exit pupil center check, D-5.)

2-2 Preparations



See Disassembly and assembly procedures (C-11).

- Assemble the MIRROR FRAME ① with the two screws (CUKK3X6SA *3) temporarily.
- Assemble the PARTS, ③-⑥, temporarily without the COVER②.
- Fix the R-SLEEVE ⑤ and the HELICOID ASS'Y ⑥ in the center.

- Set them in the above-mentioned state on the microscope frame.
  (When microscope frame is not available, use jig (B2KC0403).)

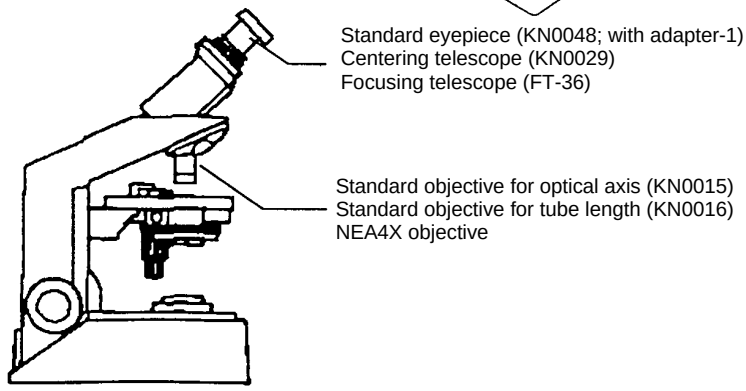
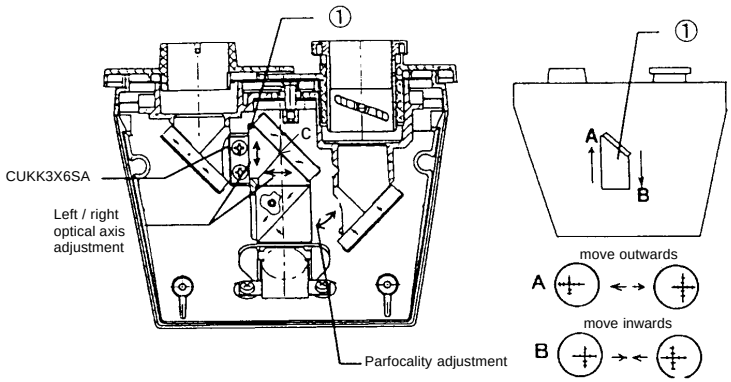


Figure-A

- Left/right optical axis adjustment
  As shown in Figure-A, set the standard objective (KN0015) and the standard eyepiece (KN0048; with adapter-1).
- Tube length adjustment
  Set the standard objective (KN0016), the standard eyepiece (KN0048; with adapter-1), and the focusing telescope (FT-36).
- Exit pupil center check
  Set NEA4X objective and the centering telescope (KN0029).

2-3 Left / right optical axis adjustment, parfocality adjustment



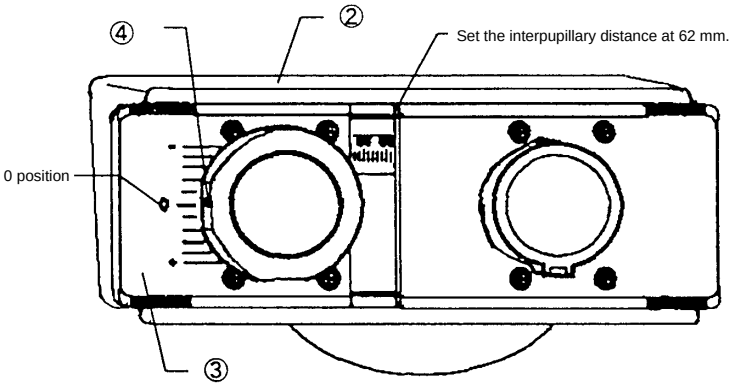
・Loosen two screws (CUKK3X6SA) securing temporarily the MIRROR ASS'Y①.
・Move the MIRROR ASS'Y ① back and forth and horizontally so that the left/right optical axis and the absolute optical axis can meet the standards.

Standard	left / right optical axis	0.3 mm or less in inward direction 0.15 mm or less in vertical direction
	absolute optical axis	0.3 mm or less.

(The use of two standard eyepieces will make you perform the work promptly.)

・Set the standard eyepiece (KN0048; with adapter-1) and the focusing telescope (FT-36), and focus on the specimen in the standard objective (KN0016). At this time, check that the parfocality meets the standard.
・If it is out of standard, adjust it by moving the MIRROR ASS'Y ① in rotating direction based on the C point as a center.

Standard	±5 graduations at 62 mm of interpupillary distance

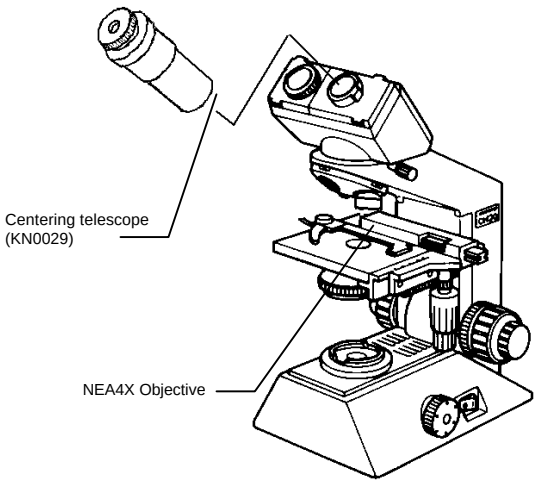


・(In optical design, the parfocality can be obtained when the optical axis was adjusted.)
・If it does not meet the above standard, return to the first step and readjust the optical axis.
・Remove the R-sleeve and the L-sleeve.
・Attach the COVER ②.
・Attach the R-sleeve and the L-sleeve.
・Confirm the left/right optical axis again.
・When it is out of standard, adjust the position of the sleeve.

Deciding the position of division plate
・Set the interpupillary distance at 62 mm.
・Read the tube length in the right sleeve with helicoid scale of KN0048, and move the standard eyepiece to the left sleeve in that condition. When the focus is obtained in the left sleeve, stick the DIVISION PLATE ④ (refer to left figure) so that its mark is adjusted to 0 position of the left

SLEEVE ③.

2-4 Exit pupil center check



- Set the centering telescope (KN0029) to the right sleeve.
- Focus on the objective's exit pupil.
- Make sure that the exit pupil center meets the standard.
  When it is out of standard, change the prism (LP167000).
  See Disassembly and assembly procedures, C-12.

Standard	20% or less of exit pupil diameter

1. List of Jigs and Tools

No.	Description	Page
KN0015	LB standard objective for optical axis	B-2, D-1, 3
KN0016	LB standard objective for tube length	B-2, D-3, 4
KN0029	Centering telescope	B-2, D-1, 3, 5
KN0048	Universal standard eyepiece with cross hairs	B-2, D-1, 3, 4
BKN0003	Standard tube	D-1
FT-36	Focusing telescope	B-2, D-3, 4
B2KC0403	Positioning jig for circular dovetail	D-3 (Use when microscope frame is not available.)
OT0085	Tension gauge (110 g)	B-1, C-7
OT0086	Tension gauge (300 g)	B-1, C-7, 9, 10
OT0315	Tension gauge (3 kg)	B-1, C-6, 12
OT1949	Thickness gauge	B-1, C-9

1. List of Lubricants

No.	Description	Page
OT1892	Grease (light)	C-11
OT2006	Grease (heavy)	C-2
OT2008	Grease (medium)	C-1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13

2. List of Chemicals

No.	Description	Page
OT1028	Epoxy adhesive (12 hours)	C-2, 3, 4, 6, 7, 9
OT1131	Shellac	C-2, 7, 9, 10
OT1338	Cyanoacrylate adhesive	C-13
OT1873	Silicone adhesive (black)	C-12, 13, 14