OLYMPUS®

INSTRUCTIONS

CH30/CH40

BIOLOGICAL MICROSCOPE

This instruction manual is for the Olympus Biological Microscope Models CH30/CH40. To ensure the safety and obtain optimum performance and to familiarize yourself fully with the use of this microscope, we recommend that you study this manual thoroughly before operating the microscope. Retain this instruction manual in an easily accessible place near the work desk for future reference.

AX6000

IMPORTANT

⚠ SAFETY PRECAUTIONS

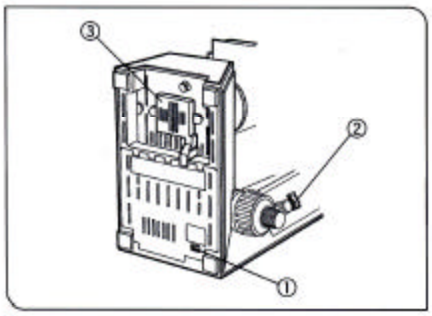


Fig. 1

1. Make sure that the voltage selector switch ① located on the underside of the base of the microscope frame is set to conform with the local mains voltage. Move the switch using an Allen wrench, etc. (Fig. 1)
◎ When shipped from the factory, the switch is set to 110-120V and 230-240V in 100V and 200V areas, respectively.
2. To avoid potential shock hazard and fire, always switch the main switch ② to "O" (OFF) and disconnect the power cord from the wall outlet before replacing the bulb. Allow the lamp housing cover ③ and the bulb to cool before touching.
3. Install the microscope on a level table. The air vents on the underside of the base should never be blocked such as by placing the microscope on a flexible surface, e.g., a carpet, etc., as this could result in overheating and cause a fire.
4. Always use the power cord provided by Olympus. If no power cord is provided, please select the proper power cord by referring to the section "PROPER SELECTION OF THE POWER SUPPLY CORD" at the end of this instruction manual. If the proper power cord is not used, Olympus can no longer warrant the electrical safety and performance of the equipment.
5. Connect the power cord correctly and ensure that the **ground terminal** of the power supply and that of the wall outlet are properly connected. If the equipment is not grounded, Olympus can no longer warrant the electrical safety and performance of the equipment.
6. Never insert metal objects, etc. into the air vents of the microscope frame as this will result in electrical shock and/or personal injury.

Safety Symbols

The following symbols are found on the microscope. Study the meaning of the symbols, and always use the microscope in the safest possible manner.

Symbol	Explanation
	Indicates that the surface becomes hot, and should not be touched with bare hands.
	Before use, carefully read the instruction manual. Improper handling could result in injury to the user and/or damage to the equipment.
I	Indicates that the main switch is ON.
O	Indicates that the main switch is OFF.

1 Getting Ready

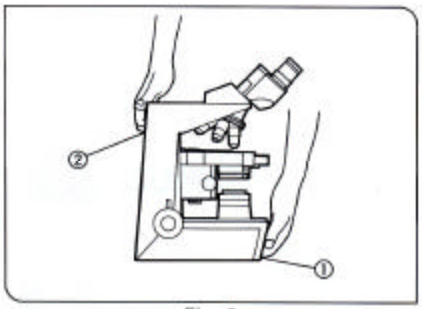


Fig. 2

1. A microscope is a precision instrument. Handle it with care and avoid subjecting it to sudden or severe impact.
2. Do not use the microscope where it is subjected to direct sunlight, high temperature and humidity, dust or vibrations. (For operating environment conditions, refer to and adhere to the conditions specified in Section 6, SPECIFICATIONS on page 16.)
3. The tension of the coarse focus adjustment knob should only be adjusted by means of the tension adjustment ring.
4. Heat from this microscope is led away by natural convection. Consequently, do not use it in a constricted space and ensure that the room is well ventilated.
5. When moving the microscope, carry it with one hand under the base ① and the other hand holding at the recessed handle on the rear of the arm ② as shown in the illustration on the left. Handle the microscope with care when moving it.
   - ★ **When moving the microscope, never hold the stage or binocular section of the observation tube, etc. Also make sure that eyepieces, specimen, etc. do not fall off.**
   - ★ **Sliding the microscope on the surface of the table may damage or tear off the rubber feet and/or scratch the table top surface.**

2 Maintenance and Storage

1. Clean all glass components by wiping gently with gauze. To remove fingerprints or oil smudges, wipe with gauze slightly moistened with a mixture of ether (70%) and alcohol (30%).
   - ★ **Do not use a mixture of ether (70%) and alcohol (30%) to clean the lower lens (made of optical plastic) of the eyepiece (NCWHK10X) because such solvents cloud the lens. If dust adheres to the lens, blow it off or wipe it away gently with a dry cloth.**
   - ⚠ **Since solvents such as ether and alcohol are highly flammable, they must be handled carefully. Be sure to keep these chemicals away from open flames or potential sources of electrical sparks — for example, electrical equipment that is being switched on or off. Also remember to always use these chemicals only in a well-ventilated room.**
2. Do not attempt to use organic solvents to clean the non-optical components of the microscope. To clean these, use a lint-free, soft cloth lightly moistened with a diluted neutral detergent.
3. Do not disassemble any part of the microscope as malfunction or damage may occur.
4. When not using the microscope, keep it covered with the provided dust cover.

3 Warning Labels

Warning labels are affixed at parts where special precaution is required when handling and using the microscope. Always heed the warnings.

Warning Label Position	Base Underside	[Caution for Bulb Replacement]

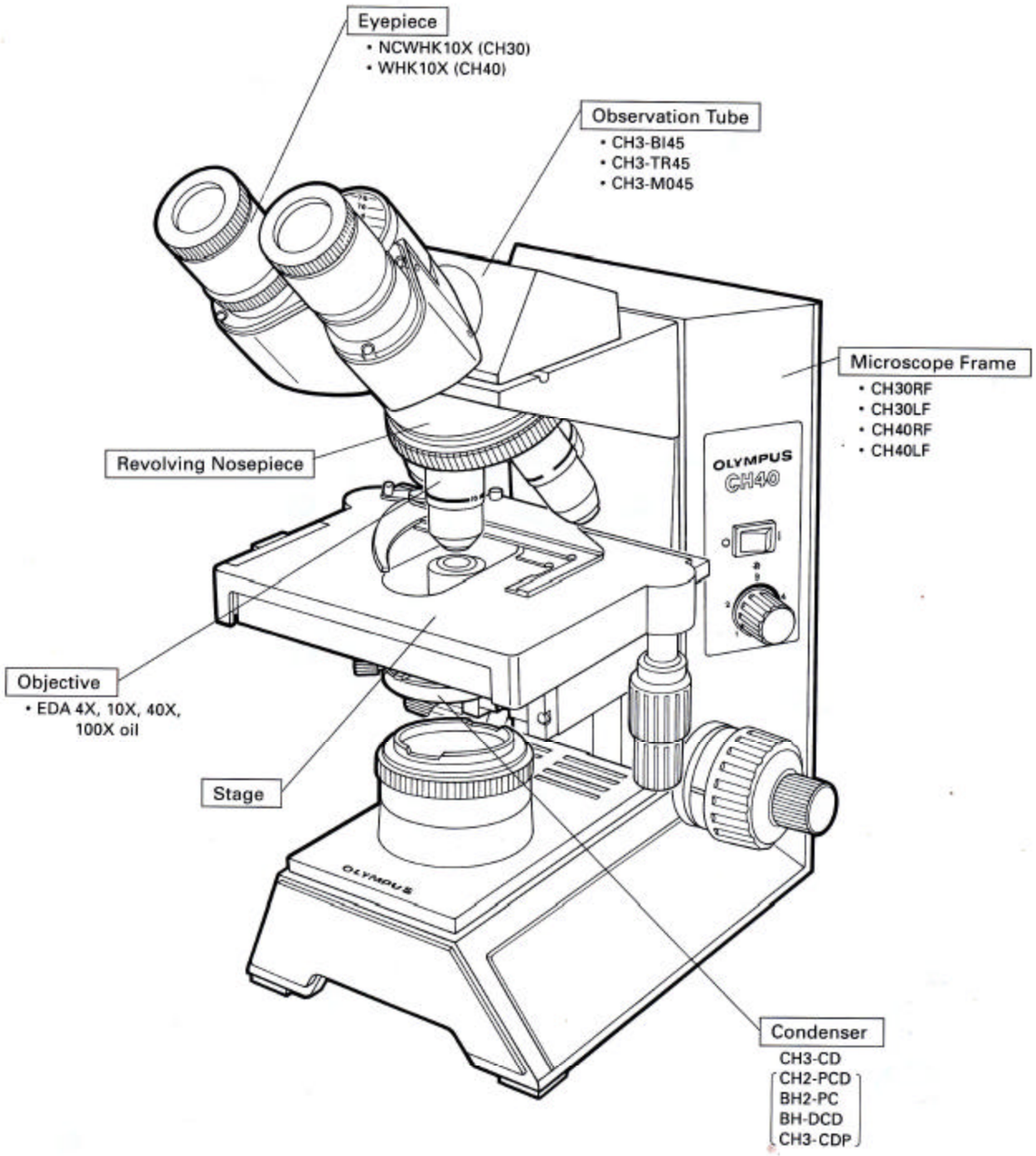
If warning labels become soiled, peel off, etc. contact your local Olympus representative to have them replaced.

4 Caution

If the microscope is operated in a manner not specified by this manual, the safety of the user may be imperiled. In addition, the equipment may also be damaged. Always operate the equipment as outlined in this instruction manual.

CONTENTS

1 NOMENCLATURE



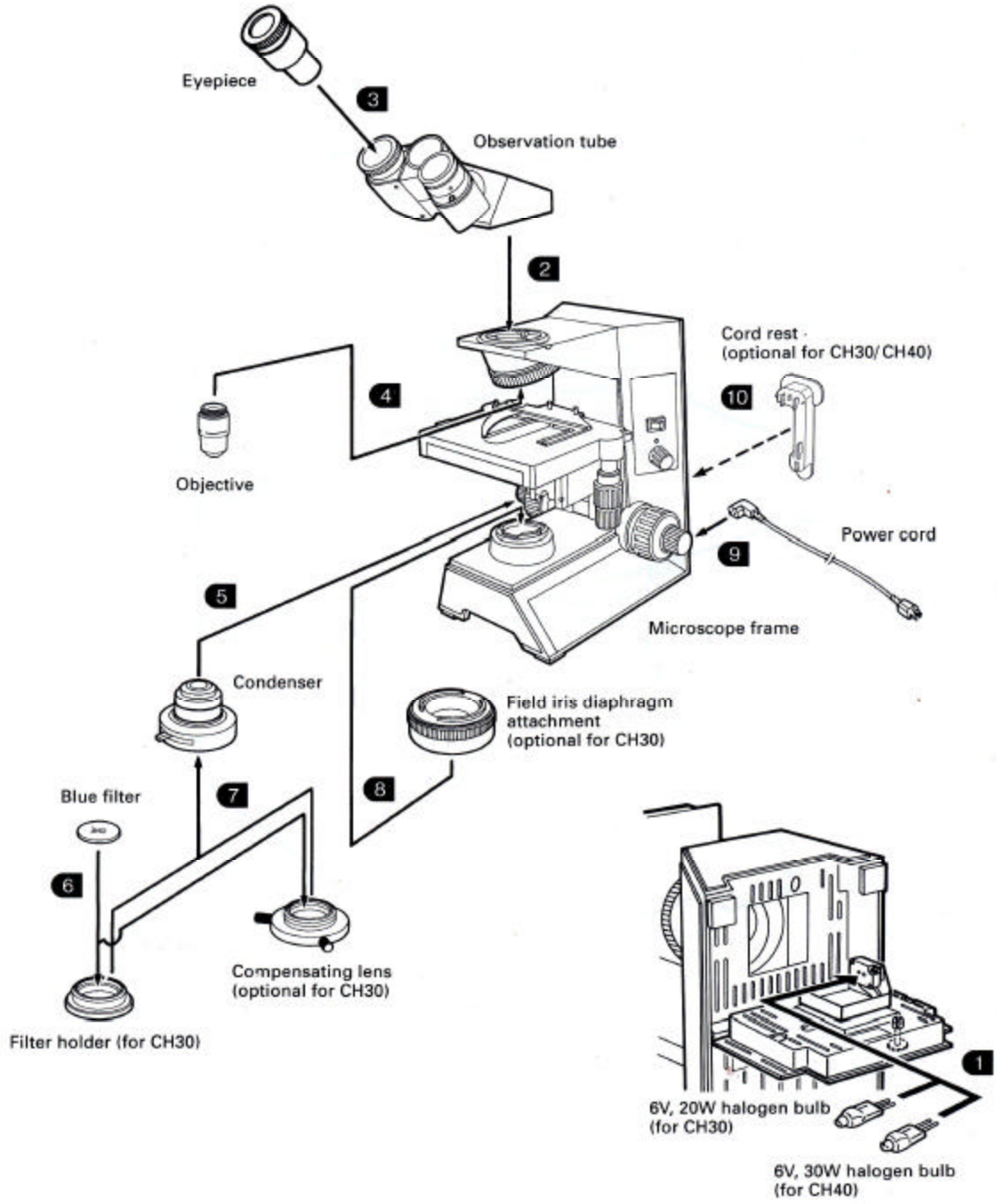
2 ASSEMBLY

2-1 Assembly Diagram

The diagram below shows how to assemble the various components. The numbers indicate the order of assembly.

★ When assembling the microscope, make sure that all parts are free of dust and dirt, and avoid scratching any parts or touching glass surfaces.

★ Retain the provided Allen wrench. It should be used when units are replaced or added.



2-2 Detailed Assembly Procedure

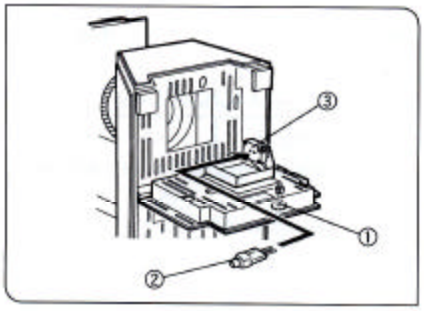


Fig. 1

1 Mounting the Bulb (Replacement) (Fig. 1)

1. Turn the microscope frame on its side and pull the lamp housing knob ① on the underside of the base to open the lamp housing cover.
2. Holding the halogen bulb ② contained in the polyethylene bag to avoid leaving fingerprints on the bulb, fully insert the contact pins into the bulb socket ③. When properly seated, pull off the polyethylene bag.

《 Applicable Bulb 》

CH30: 6V, 20W Halogen bulb: 6V20W HAL (Philips 7388)
CH40: 6V, 30W Halogen bulb: 6V30W HAL (Philips 5761)

⚠ **Always use the designated bulb. Use of improper bulb may result in fire.**

⚠ **Do not touch the bulb with bare hands. If fingerprints are accidentally left on the bulb, wipe the bulb with a soft, lint-free cloth moistened with alcohol. Using a contaminated bulb will shorten the service life of the bulb.**

3. With the lamp housing knob still pulled out, close the lamp housing cover. Then push in the lamp housing knob to lock the cover.
   ★ **The lamp housing cover cannot be closed if the knob is pushed in before you attempt to close cover.**

Precautions for Halogen Bulb Replacement

⚠ **Whenever you replace the bulb during use or right after use, first move the main switch to "O" (OFF), disconnect the power cord from the wall outlet, and allow the bulb and parts around the bulb to cool before touching.**

★ **If the bulb burns out during an observation and needs to be replaced, remove eyepieces, specimen, and other objects likely to fall off, before tilting the microscope frame to replace the bulb.**

Fig. 2

2 Mounting the Observation Tube (Fig. 2)

1. Using the provided Allen wrench, loosen the observation tube clamping screw ①.
2. Insert the circular dovetail mount at the bottom of the observation tube into the opening on the microscope frame, positioning the observation tube to point the binocular eyepieces towards the front. Clamp the observation tube by tightening the clamping screw ①.

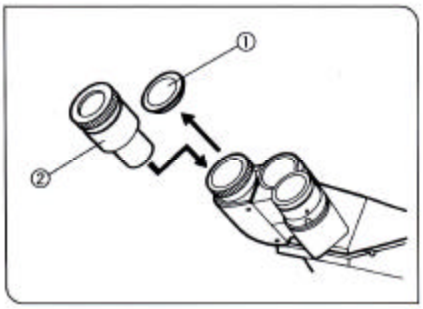


Fig. 3

3 Mounting the Eyepieces (Fig. 3, 4)

Binocular Tube (CH3-BI45), Monocular Tube (CH3-MO45)

1. Remove the eyepiece dust cap ①. (Fig. 3)
2. Insert the eyepiece ② into the eyepiece sleeve as far as it will go. (Fig. 3)
3. Mount the other eyepiece in the same manner.

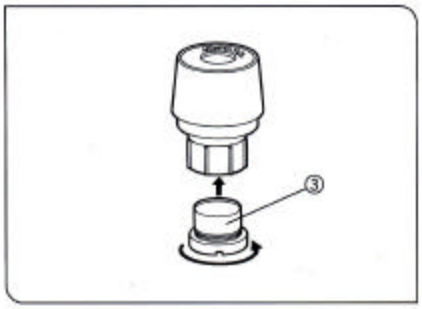


Fig. 4

Using Eyepiece Micrometer Discs (optional)

Eyepiece micrometer discs can be inserted into the NCWHK10X eyepieces. Use 10 mm/100 micrometer discs.

1. Unscrew the micrometer mounting frame ③ from the eyepiece by turning counterclockwise.
2. Place a micrometer disc into the frame. The engraving on the micrometer disc should face downward into the micrometer mounting frame ③. (Fig. 4)
3. Screw the micrometer mounting frame back into the eyepiece tube. (Fig. 4)

★ **Use 19 mm diameter micrometer discs.**

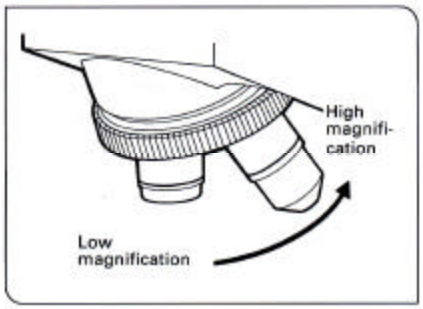


Fig. 5

4 Mounting the Objectives (Fig. 5)

Mount the objectives on the revolving nosepiece in such a manner that the magnification increases from low to higher powers in a counterclockwise direction.

◎ If there are empty sockets with no objective mounted, make sure to attach the provided dust plugs.

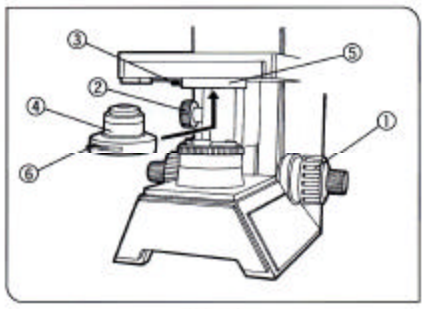


Fig. 6

5 Mounting the Condenser (Fig. 6)

1. Turn the coarse adjustment knob ① to raise the stage to its highest position.
2. Turn the condenser height adjustment knob ② to lower the condenser holder to the position where the clamping screw ③ can be turned.
3. Insert the condenser ④ into the mounting hole ⑤ and clamp by tightening the clamping screw ③. Positioning the condenser with the diaphragm lever ⑥ at the front facilitates operation.
4. Turn the condenser height adjustment knob ② to raise the condenser holder to its highest position.

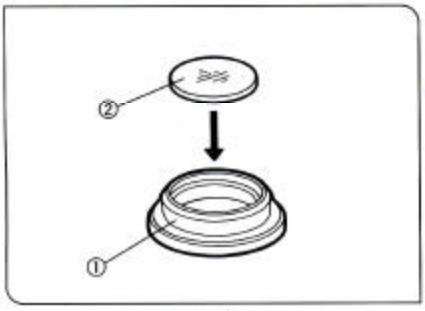


Fig. 7

6 Mounting the Blue Filter (Fig. 7)

◎ The blue filter converts the color temperature of tungsten illumination into the color temperature of daylight to show the specimen in natural colors.
Place the 32.5 mm diameter blue filter ② in the filter holder ① or the compensating lens.

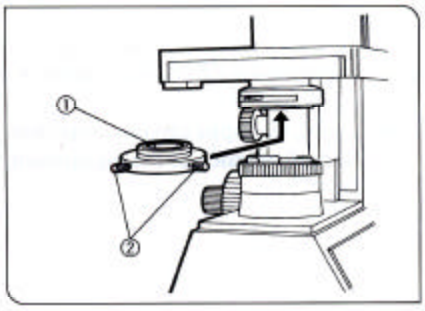


Fig. 8

7 Mounting the Filter Holder or the Compensating Lens (Fig. 8)

1. Insert the filter holder or the compensating lens ① into the condenser from below until it seats with click.
2. When mounting the compensating lens, place the lens so that the centering screws ② are at the front.

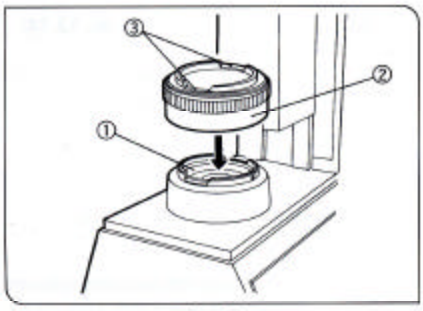


Fig. 9

8 Mounting the Field Iris Diaphragm Attachment (CH30 only) (Fig. 9)

Holding the field iris diaphragm attachment ② over the light glass exit ① with the filter holder notches ③ positioned as shown in Fig. 9, insert the attachment into the light glass exit opening until it seats with a click.

★ **Attempting to insert the attachment with the notches ③ facing in other directions than shown in Fig. 9 may break the mounting clip.**

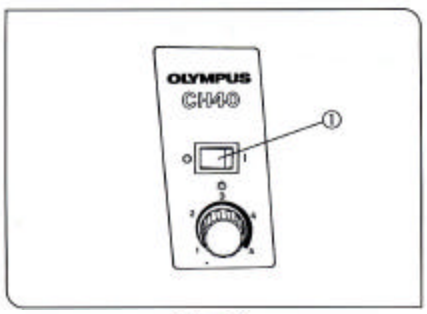


Fig. 10

9 Connecting the Power Cord (Figs. 10,11,12)

⚠ **Cables and cords are vulnerable when bent or twisted. Never subject them to excessive force.**

⚠ **Make sure that the main switch ① is on "O" (OFF) before connecting the power cord. (Fig. 10)**

⚠ **Always use the power cord provided by Olympus.**
If no power cord is provided, please select the proper power cord by referring to the section "PROPER SELECTION OF THE POWER SUPPLY CORD" at the end of this instruction manual.

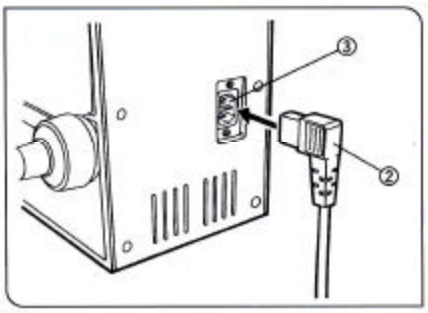


Fig. 11

1. Connect the power cord plug ② to the AC receptacle ③. (Fig. 11)

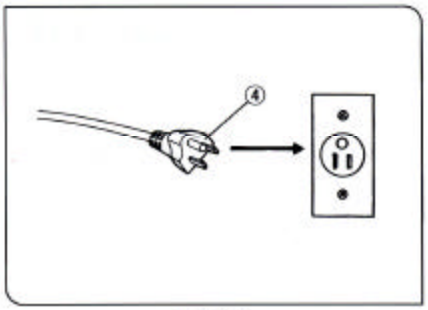


Fig. 12

2. Plug the power cord plug ④ into a wall outlet. (Fig. 12)

⚠ Connect the power cord correctly and ensure that the ground terminal of the power supply and that of the wall outlet are properly connected.
If the equipment is not grounded, Olympus can no longer warrant the electrical safety and performance of the equipment.

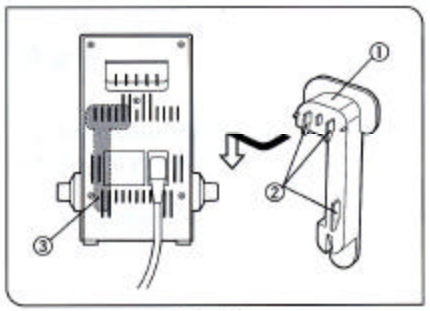


Fig. 13

10 Cord Rest (CH3-CH) (optional) (Figs. 13,14)

◎ When the cord rest (CH3-CH) is attached on the rear panel of the microscope frame, the power cord can be wound around it for storage.
Align the hooks ② on the cord rest ① with the air vent slits at ③, and insert the hooks into the slits until the cord rest is pressed against the rear panel of the microscope frame. Then pull the cord rest down to secure it.

Note: The illustration of the cord rest only shows the sections relevant for the explanation here. The actual cord rest looks somewhat different.

★ **Do not grasp the cord rest when moving the microscope. The cord rest may suddenly come loose and you may drop the microscope causing material damage or personal injury.**

Detaching—Move the microscope frame to the edge of the table ④. Then apply a screwdriver ⑤ or Allen wrench to the lower portion of the cord rest ① and push in the 1 2 directions to move the entire cord rest upward to allow it to be detached.

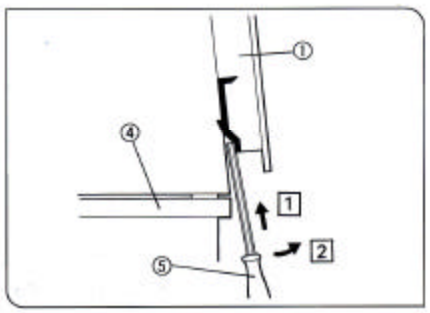
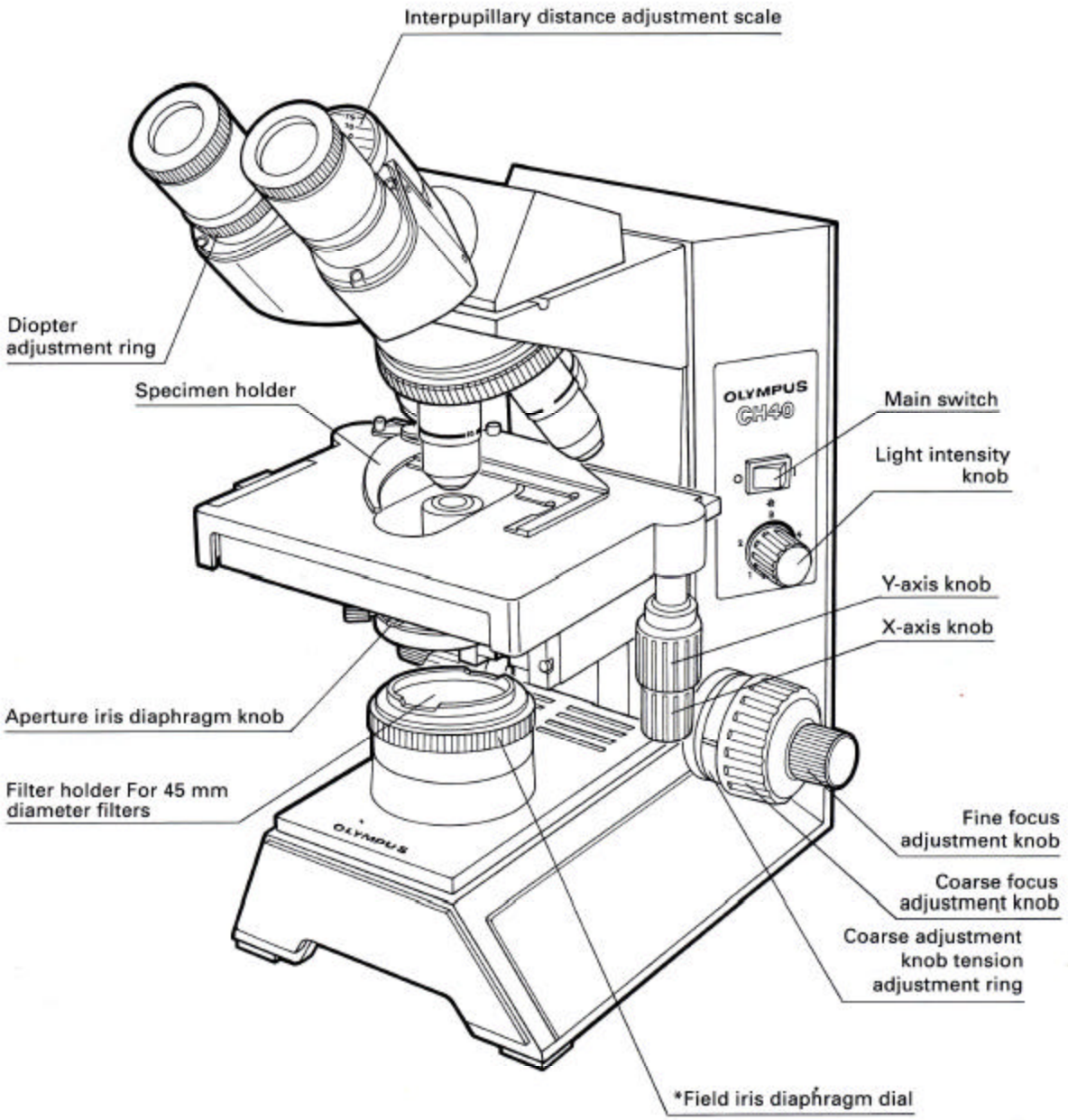


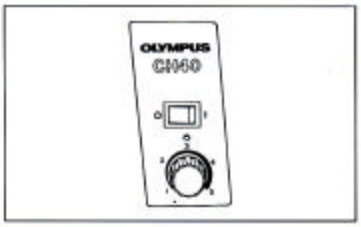
Fig. 14

3 CONTROLS

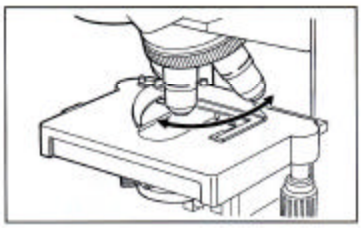


*The CH30 is not equipped with the field iris diaphragm function but an optional field iris diaphragm attachment can be mounted.

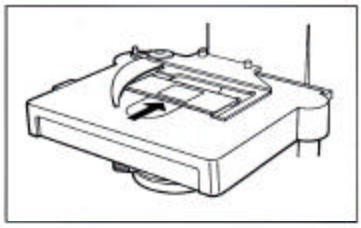
4 SUMMARY OF OBSERVATION PROCEDURES



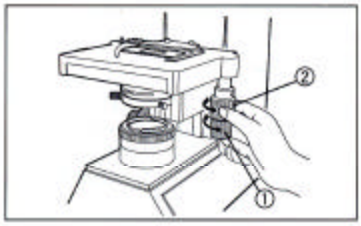
1. Switch the main switch to "|" (ON) and adjust the brightness with the light intensity knob. (Page 10)



2. Turn the revolving nosepiece to engage the 10X objective. Make sure that the revolving nosepiece stops with an audible click.

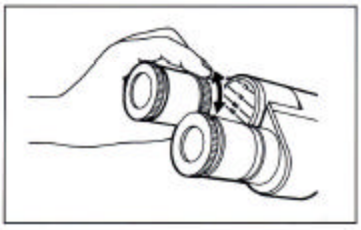


3. Place a specimen on the stage. (Page 10)

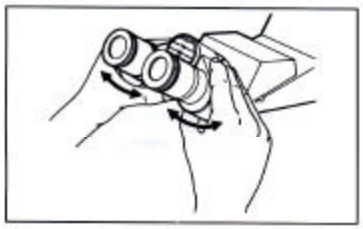


4. Turn the X-axis knob ① and Y-axis knob ② to move the specimen into the light path. (Page 11)

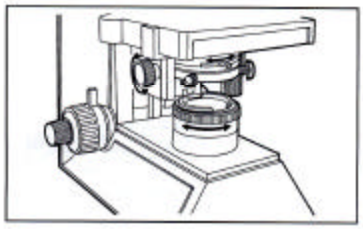
5. Looking through the right eyepiece with your right eye, turn the coarse adjustment knob to bring the specimen into focus.
After obtaining approximate focus, use the fine adjustment knob to make fine adjustments.



6. Looking through the left eyepiece with your left eye, turn the diopter adjustment ring to focus the specimen. (Page 11)

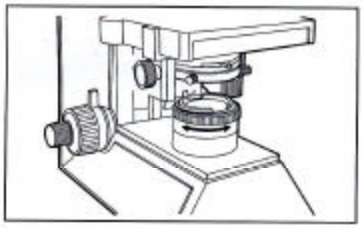


7. Adjust the interpupillary distance of the eyepieces. (Page 11)

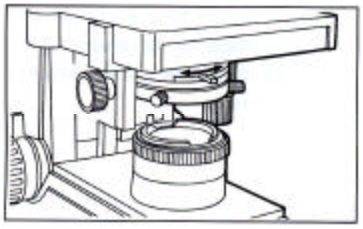


8. Center the field iris diaphragm by manipulating the two centering screws on the compensating lens. (CH40 only) (Page 12)
   In case of CH30, centration is not necessary. If the optional field iris diaphragm attachment is mounted, center the attachment in the same manner as described above.

9. Engage the objective to be used for observation and adjust the light intensity to the desired level, then readjust the focus.



10. Adjust the field iris diaphragm.
    This only applies to the CH30 if the optional field iris diaphragm attachment is mounted.



11. Adjust the aperture iris diaphragm. (Page 12)

5 USING THE CONTROLS

5-1 Base

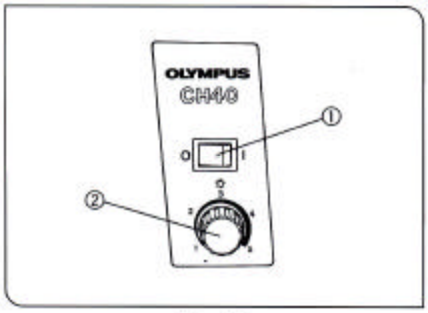


Fig. 15

1 Turning ON the Bulb (Fig. 15)

1. Switch the main switch ① to "I" (ON).
2. Turning the light intensity knob ② clockwise in the direction of higher numbers makes the illumination brighter, and vice versa.

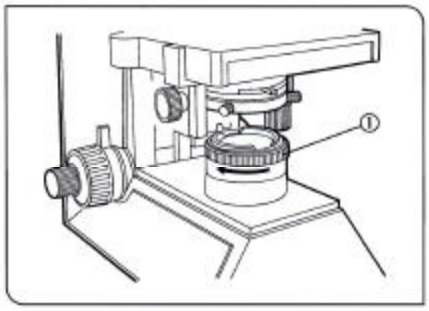


Fig. 16

2 Field Iris Diaphragm (CH40 only) (Fig. 16)

Using the field iris diaphragm dial ①, adjust the diameter of the field iris for objective power to the extent that it just circumscribes the field of view. When the field iris diaphragm is stopped down to circumscribe the field of view, it will exclude extraneous light and improve image contrast within the field of view.

★ **When using 100X objective, the field iris diaphragm image will not be visible within the field of view. Accordingly, stop down the diaphragm to its smallest diameter.**

◎ In case of CH30, the field iris diaphragm attachment is mounted on the light exit glass of the microscope base.

5-2 Stage

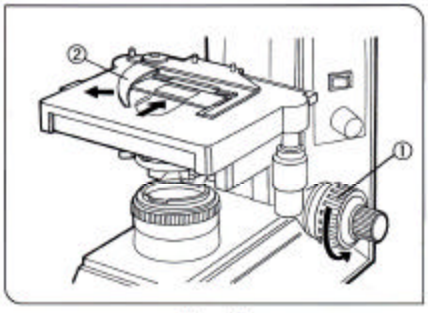


Fig. 17

1 Specimen Placement (Fig. 17)

★ **Releasing the curved finger with great force, or suddenly releasing your grip on the curved finger knob while releasing the curved finger, will crack or damage the slide glass. Always release the curved finger with great care.**

Specimen Holder for Single Slides

1. Turn the coarse adjustment knob ① counterclockwise in the direction of the arrow to lower the stage.
2. Open the spring-loaded curved finger ② on the specimen holder and slide the specimen slide into the specimen holder from the front.
3. After placing the slide as far as it will go, gently release the curved finger ②.

Specimen Holder for 2 Specimen Slides

1. Place the first specimen slide as described in steps 1 and 2 above. Then place the second specimen slide so that it contacts the first specimen slide.
2. Gently release the curved finger ②.

Placing the Specimen Slide with One Hand

Place the specimen slide at the front of the stage, then slide the specimen slide on the stage surface to slowly and gradually open the curved finger in the direction of the arrow. Insert the specimen slide into the specimen holder until it is fully and properly seated in the specimen holder.

Cover Glass

Use cover glasses of 0.17 mm thickness in combination with objectives marked with the "160/0.17" engraving for optimum performance of these objectives.

Specimen Slide

Specimen slides with a thickness between 0.9 mm and 1.2 mm are recommended for CH30/CH40 microscopes. Using thicker specimen slides may prevent correct formation of the field iris diaphragm image on the specimen surface and illumination will not be correct in case of darkfield observation.

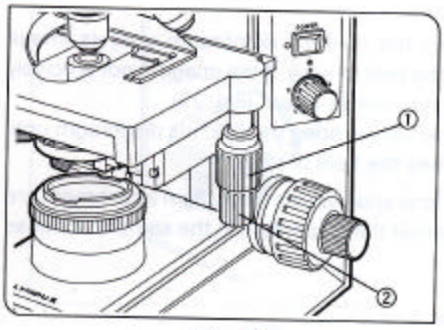


Fig. 18

2 Moving the Specimen (Fig. 18)

Turning the Y-axis knob ① moves the specimen in the Y-axis direction. Turning the X-axis knob ② moves the specimen in the X-axis direction.

★ **Never move the specimen by holding the specimen holder or stage directly as this will damage the knob rotation mechanism.**

★ **When further movement of the stage or specimen holder is prevented by the provided limiting mechanism, the tension of the Y-axis and X-axis knob rotation will increase. At this point, do not rotate the knobs further. Applying excessive force could destroy the limiting mechanism.**

5-3 Observation Tube (CH3-BI45)

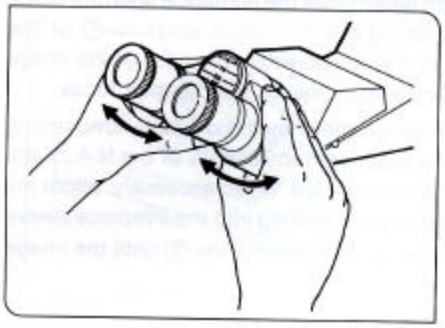


Fig. 19

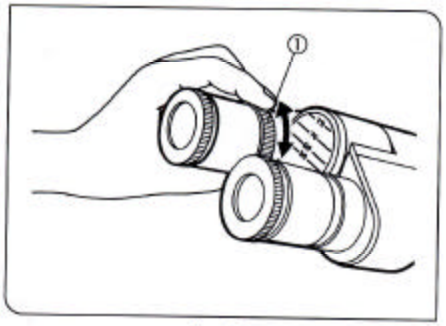
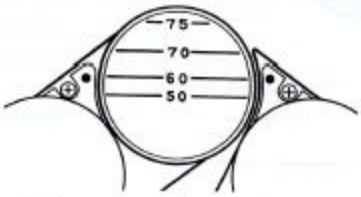


Fig. 20

1 Adjusting the Interpupillary Distance (Fig. 19)

While looking through the eyepieces, adjust for binocular vision until the left and right fields of view coincide completely.
Adjust so that the two index dots • are horizontal.



◎ Placing the interpupillary distance indexes so that they are parallel with the horizontal lines facilitates the adjustment.
Also keep the dots parallel with the horizontal lines in case of interpupillary distances other than 50, 60, 70, and 75.

◎ Note your interpupillary distance so that it can be quickly duplicated.

2 Diopter Adjustment (Fig. 20)

1. Looking through the right eyepiece with your right eye, rotate the coarse and fine adjustment knobs to bring the specimen into focus.
2. Looking through the left eyepiece with your left eye, turn the diopter adjustment ring ① to focus the specimen.

5-4 Condenser

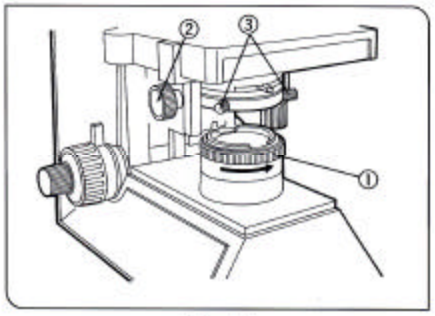


Fig. 21

1 Centering the Field Iris Diaphragm (CH40 only) (Figs. 21, 22)

1. With the 10X objective engaged and the specimen brought into focus, turn the field iris diaphragm dial ① counterclockwise to stop down the diaphragm somewhat. (Fig. 21)
2. Turn the condenser height adjustment knob ② to bring the field iris diaphragm image into focus. (Fig. 21)
3. While gradually opening the field iris diaphragm image, rotate the two centering knobs ③ of the compensating lens to adjust so that the field iris diaphragm image is centered in the eyepiece field of view. (Figs. 21, 22)

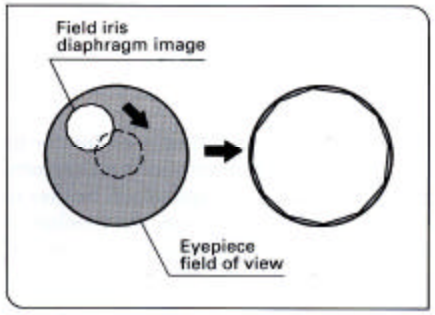


Fig. 22

4. To check centration, open the field iris diaphragm until its image touches the perimeter of the field of view. If the image is not precisely inscribed in the field of view, center again. (Fig. 22)
5. When used for actual observation, open the field iris diaphragm until its image just circumscribes the field of view.

◎ When the compensating lens and field iris diaphragm attachment are mounted on the CH30, center the diaphragm in the same manner as described above.

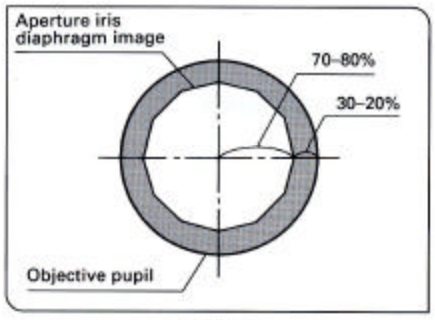


Fig. 23

2 Aperture Iris Diaphragm (Figs. 23, 24)

◎ The aperture iris diaphragm determines the numerical aperture of the illumination system. Matching the numerical aperture ① of the illumination system with that of the objective provides better image resolution and contrast, and also increases the depth of focus.

◎ Since the contrast of microscope specimens is ordinarily low, setting the condenser aperture iris diaphragm to 70–80% of the N.A. of the objective in use is usually recommended. When necessary, adjust the ratio by removing the eyepiece and looking into the eyepiece sleeve while adjusting the aperture iris diaphragm lever ② until the image shown in Fig. 23 is seen.

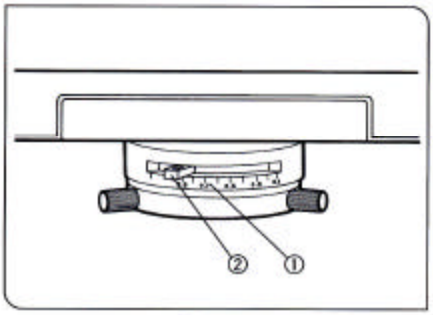


Fig. 24

5-5 Focusing Adjustment Knobs

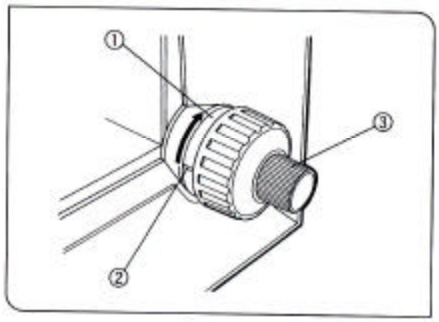


Fig. 25

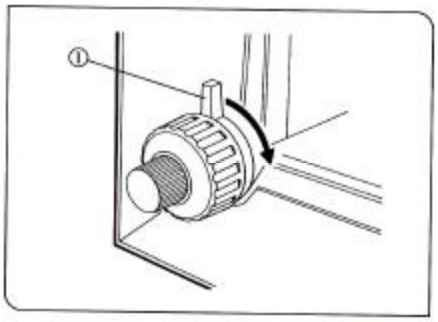


Fig. 26

1 Adjusting the Coarse Adjustment Knob Tension (Fig. 25)

1. The coarse adjustment knob tension is preadjusted for easy use. However, if desired, one can change the tension using the tension adjustment ring ①. Applying a flat-bladed screwdriver to any of the grooves ② on the circumference of the ring and turning the ring in the direction of the arrow increases tension, and vice versa.
2. The tension is too low if the stage drops by itself or focus is quickly lost after adjustment with the fine adjustment knob ③. In this case, turn the ring ① in the direction of the arrow to increase tension.

2 Pre-focusing Lever (Fig. 26)

The pre-focusing lever ensures that the objective does not come in contact with the specimen and simplifies focusing. After focusing on the specimen with the coarse adjustment knob, turn this lever ① clockwise in the direction of the arrow to set a lower limit on coarse adjustment movement.

◎ Focusing with the fine adjustment knob is not affected by this pre-focusing lever. Accordingly, after using the coarse adjustment knob to lower the stage for changing specimens or applying immersion oil (see Section 5-6), refocusing is easily accomplished by rotating the coarse adjustment knob to reach the pre-focusing position, then making fine adjustments with the fine adjustment knob.

★ **When not required, leave the pre-focusing lever unlocked.**

5-6 Immersion Objectives

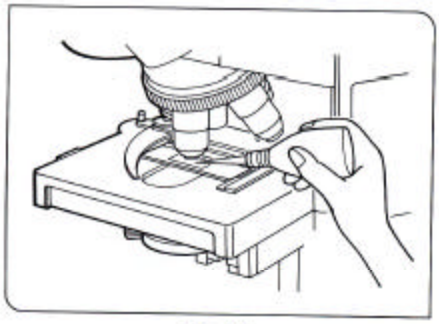


Fig. 27

1 Use of Immersion Objectives (Fig. 27)

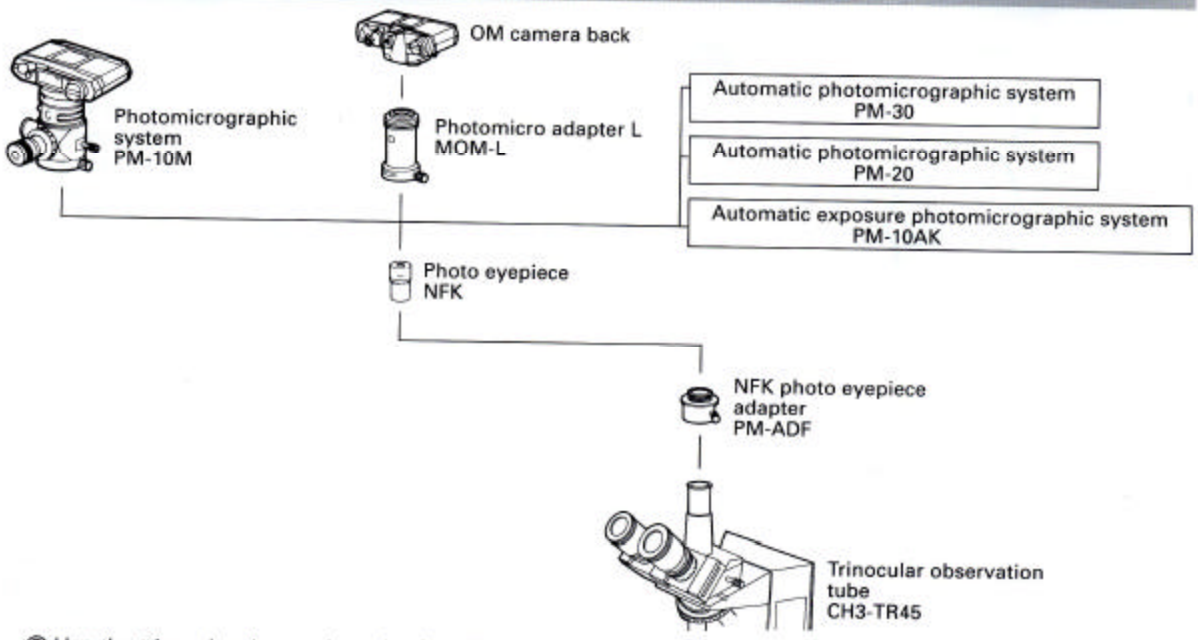
1. Focus on the specimen with a low power objective.
2. Place a drop of immersion oil (provided) onto the specimen at the area to be observed.
3. Turn the revolving nosepiece to engage the immersion objective, then focus using the fine adjustment knob.
   ★ **Since any bubbles in the oil will impair the image, make sure that the oil is free of bubbles.**
   a. To check for bubbles, remove the eyepiece and fully open the field and aperture iris diaphragms, then look at the exit pupil of the objective inside the observation tube. (The pupil should appear round and bright.)
   b. To remove bubbles, rock the nosepiece slightly to move the oil immersion objective back and forth a few times.

◎ If the condenser marking shows a numerical aperture (NA) of 1.0 or more, the number applies only when oil is present between the slide glass and the top surface of the condenser. When oil is not present, the NA is about 0.9.

4. After use, remove oil from the objective front lens by wiping with gauze slightly moistened with an ether (7 parts) / alcohol (3 parts) mixture or with EE-6310.
   ★ **Using too much alcohol can dissolve the lens adhesive.**

⚠ **Caution on Using the Immersion Oil:**
If the immersion oil comes into contact with your eye or skin, immediately take the following action.
For eye: Rinse with clean water (for more than 15 min.).
For skin: Wash with soap and water.
If the appearance of the eye or skin changes or pain continues, please consult your doctor.

5-7 Photomicrography



◎ Use the trinocular observation tube CH3-TR45 for photomicrography

★ **Use a heat absorbing filter (45HA) when using the PM-10, PM-20, and PM-30 photomicrographic systems.**

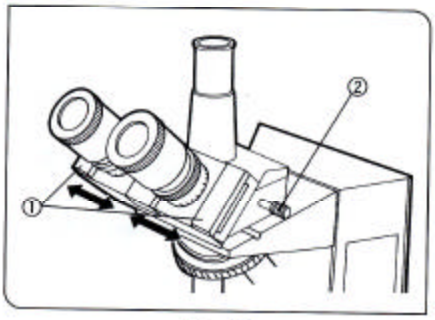


Fig. 28

1 Selecting the Light Path (CH3-TR45) (Fig. 28)

◎ The interpupillary distance adjustment procedure of the trinocular observation tube (CH3-TR45) is different from that of the binocular observation tube (CH3-BI45). The interpupillary distance dovetail slides ① on the CH3-TR45 should be moved to make the adjustment.

Move the light path selector knob ② to select the required light path.

◎ For normal observation, the light path selector knob should be pushed in. For TV and still photomicrography, pull out the knob.

Light path selector knob	Intensity ratio	Application
Pushed in	100% for binocular eyepieces	Observation of dark specimens
Pulled out	20% for binocular eyepieces, 80% for TV/photomicrography	Observation of bright specimens, photomicrography, TV observation

★ **In case of long time exposure, ambient light in the room will enter through the observation tube and the eyepieces and may create ghost images or flare. To block this extraneous light, dim the room or cap the eyepieces or the focusing telescope.**

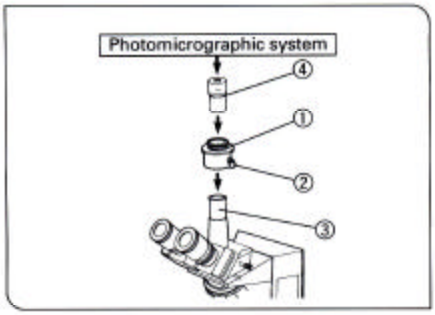


Fig. 29

2 Mounting the Camera Unit (Fig. 29)

1. Loosen the clamping screw ② of the NFK photo eyepiece adapter (PM-ADF) ①.
2. Attach the NFK photo eyepiece adapter (PM-ADF) ① to the trinocular observation tube (CH3-TR45) ③ and tighten the clamping screw ②.
3. Insert the NFK photo eyepiece (3.3X or 5X) ④ into the NFK photo eyepiece adapter (PM-ADF) ①.
4. Mount the camera unit directly on the NFK photo eyepiece adapter (PM-ADF) ①.

Using an OM Camera Back

To use an OM camera back, mount the photo eyepiece adapter PM-ADF ① (into which a choice of NFK photo eyepiece is inserted), the photomicro adapter MOM-L ② and the OM camera back on the photo tube in the described order.

- Use the 3.3X or 5X NFK photo eyepiece.
- Focus using the finder of the camera back.
- Photomicrographic magnification
  = Objective magnification X Photo eyepiece magnification.

★ **To take a good photomicrography with a single lens reflex camera back, a shutter speed at 1/2 second or slower is recommended so as to reduce the mirror-lockup shock.**

3 Focus Adjustment

The focus of the eyepieces and the camera film plane are not the same. Consequently, always perform camera focusing by using the focusing telescope of the camera unit. For details, refer to the instruction manual of the photomicrographic system.

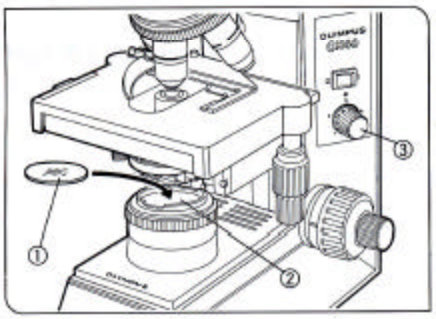


Fig. 30

4 Color Temperature Compensation (Fig. 30)

◎ When using daylight type film in the camera.

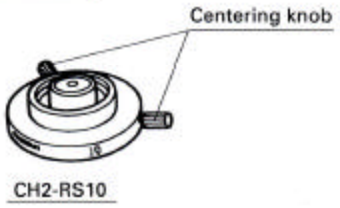
★ **The blue filter is solely designed for visual observation (daylight). If this filter is engaged while taking photographs with daylight film, the color reproduction will be poor.**

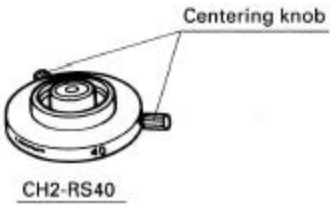
1. Mount the light balancing filter (45LBD-2N) ① in the filter holder ② of the microscope frame.
2. Turn the light intensity knob ③. To obtain illumination close to daylight, set the index of the knob at 5 in case of the CH30, and 4 in the case of CH40.

5-8 Phase Contrast Attachments

1 Nomenclature

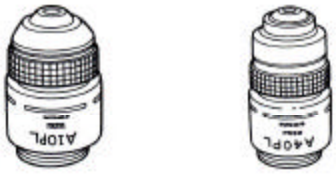
Light Annuli



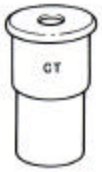


Green Filter

Phase Contrast Objectives PCDA10 X PL/PCDA40 X PL



Centering Telescope CT-5



2 Mounting the Phase Contrast Attachment

Mount the phase annulus (CH2-RS10/CH2-RS40) in the same way as the filter holder.

★ **Replace previously mounted objectives with the phase contrast objectives.**

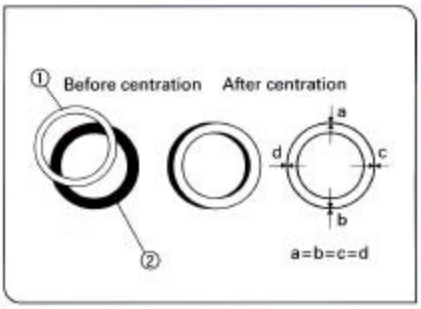


Fig. 31

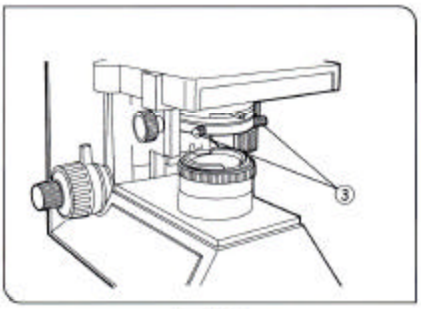


Fig. 32

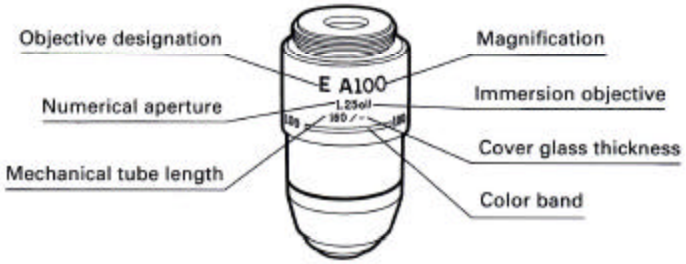
3 Using the Phase Contrast Attachment (Figs. 31 & 32)

1. Turn the revolving nosepiece to move the objective with the same number as the mounted light annulus.
2. Set the specimen on the stage and bring it into focus.
3. Remove either one of the eyepieces and insert the centering telescope (CT-5) into the eyepiece tube.
4. Rotate the CT-5's upper lens assembly so that the bright ring ① (light annulus in the condenser) and the dark ring ② (phase annulus in the objective) come into focus. (Fig. 31)
5. Rotate the two light annulus centering knobs ③ until the light annulus and phase annulus are concentric and superimposed. (Figs. 31 & 32)
6. Remove the CT-5 and insert the eyepiece back into the eyepiece tube to perform phase contrast observation.
7. To increase image contrast, mount the filter on the filter holder.

6 SPECIFICATIONS

Item	Specifications	
	CH30	CH40
Optical system	LB optical system (finite-corrected system)	
Illumination	Illuminator built-in	
	6V 20 W halogen bulb Philips 7388 (Average service time: Approximately 100 hrs. when used as directed)	6V 30 W halogen bulb Philips 5761 (Average service time: Approximately 100 hrs. when used as directed)
	CH30RF100/LF100: 100/110–120V, 50/60 Hz 0.3A 100–120V area CH30RF200/LF200: 220/230-240V, 50/60 Hz 0.15A 220–240V area	CH40RF100/LF100: 100/110–120V, 50/60 Hz 0.42A 100–120V area CH40RF200/LF200: 220/230–240V, 50/60 Hz 0.21A 220–240V area
Focusing	Stage movement by roller guide (Rack & Pinion) Stroke per rotation: 39.6 mm Full range stroke: 25 mm Upper limit stopper Torque adjustment on coarse focus knob	
Revolving nosepiece	Build-on quadruple nosepiece with inward tilt	Build-on quintuple nosepiece with inward tilt
Observation tube	Monocular CH3-MO45	Tube inclination 45°
	Binocular CH3-BI45	Tube inclination 45° Interpupillary distance adjustment 48–75 mm
Stage	Size	188 mm x 134 mm
	Movement	76 mm X-direction X 50 mm Y-direction
	Specimen holder	Double slide holder
Condenser	Type	Abbe condenser
	N.A.	1.25 (with oil immersion)
	Aperture iris diaphragm	Provided
	Dimensions and weight	233(W) x 392(H) x 301(D) mm; 8.2 kg (18 lb) (CH30)/8.5 kg (18.7 lb) (CH40)
Operating environment	• Indoor use • Altitude: Max. 2000 m • Ambient temperature: 5° to 40°C(41° to 104°F) • Maximum relative humidity 80% for temperatures up to 31°C (88°F) decreasing linearly through 70% at 34°C (93°F), 60% at 37°C (99°F), to 50% relative humidity at 40°C (104°F) • Main supply voltage fluctuations not to exceed ±10% of the nominal voltage. • Pollution Degree 2 (in accordance with IEC 664) • Installation/Overvoltage Category II(in accordance with IEC 664)	

7 OPTICAL CHARACTERISTICS



CH30

Objective \ Optical character	Magnification	N.A.	W.D. (mm)	Resolution (μm)	Eyepiece NCWHK10X (FN. 18) Total mag.	Depth of focus (μm)	Field of view	Remarks
EDAch Achromat	4X	0.10	29	3.4	40X	175	4.5	
	10X	0.25	6.30	1.3	100X	28.0	1.8	
	40X	0.65	0.53	0.52	400X	3.04	0.45	Spring-loaded
	100X	1.25	0.20	0.27	1000X	0.66	0.18	Spring-loaded Oil immersion

CH40

Objective \ Optical character	Magnification	N.A.	W.D. (mm)	Resolution (μm)	Eyepiece WHK10X (FN. 20) Total mag.	Depth of focus (μm)	Field of view	Remarks
EDAch Achromat	4X	0.10	29	3.4	40X	175	5.0	
	10X	0.25	6.30	1.3	100X	28.0	2.0	
	40X	0.65	0.53	0.52	400X	3.04	0.5	Spring-loaded
	100X	1.25	0.20	0.27	1000X	0.66	0.2	Spring-loaded Oil immersion

* The resolving power of immersion objectives is obtained with the aperture iris diaphragm fully open.

Glossary

Working distance (W.D.): The distance from the cover glass surface to the nearest point of the objective.

Numerical aperture (N.A.): The N.A. value represents a performance number which can be compared to the relative aperture (f-number) of a camera lens. The higher N.A., the higher the resolving power.

Resolving power: The ability to differentiate two points, i.e., the minimum distance by which the objects must be separated in order to be revealed as two separate objects.

Focal depth: The depth in the image through which the focused image will appear uniformly sharp. As the aperture iris diaphragm is stopped down, the focal depth becomes greater. The greater the N.A. of an objective, the shorter the focal depth.

Field number: A number that represents the diameter in mm of the image of the field diaphragm that is formed by the lens in front of it.

Field of view diameter: The actual size of the field of view in millimeters.

Total magnification: Equals the objective magnification multiplied by the eyepiece magnification.

8 TROUBLESHOOTING GUIDE

Under certain conditions, performance of this unit may be adversely affected by factors other than defects. If problems occur, please review the following list and take remedial action as appropriate. If you cannot solve the problem after checking the entire list, please contact your local Olympus representative for assistance.

Problem	Cause	Remedy	Page
1. Optical System			
a. Field of view is obscured, or field of view is not evenly illuminated.	Nosepiece is not correctly engaged.	Make sure that the revolving nosepiece clicks properly into place.	8
	The condenser is not correctly attached.	Re-insert the condenser all the way without tilt.	4
	The field iris diaphragm is not properly centered. (CH40 only)	Center the field iris diaphragm.	12
	The field iris diaphragm is stopped down too far.	Open the field iris diaphragm.	12
	Dirt/dust on the objective, eyepiece, condenser, and/or light exit glass.	Clean thoroughly.	—
b. Dirt or dust is visible in the field of view.	Dirt/dust on the light exit glass.	Clean thoroughly.	—
	Dirt/dust on the top lens of the condenser.		
	Dirt/dust on the specimen.		
	Dirt/dust on the eyepiece.		
c. The image shows diffraction.	The condenser is lowered too far.	Adjust the condenser height position.	—
	The aperture iris diaphragm is stopped down too far.	Open the aperture iris diaphragm.	12
d. Visibility is poor. • Image is not sharp. • Contrast is poor. • Details are indistinct.	The objective is not correctly engaged in the light path.	Make sure that the revolving nosepiece clicks into place correctly.	8
	Front lens of the objective is dirty.	Clean the objective.	—
	Immersion oil is not being used with an oil immersion objective.	Use immersion oil.	13
	The immersion oil contains bubbles.	Remove bubbles.	13
	Recommended immersion oil not used.	Use the provided immersion oil.	—
	Specimen is dirty.	Clean.	—
	Eyepiece, condenser is dirty.	Clean.	—
e. Part of the image is blurred.	The objective is not stopped at the click-stop.	Make sure that the revolving nosepiece clicks into place correctly.	8
	The specimen is not mounted correctly on the stage.	Place the specimen correctly on top of the stage and secure it with the specimen holder.	10,11
f. The image has a yellow tint.	The blue filter is not engaged.	Engage the blue filter.	5

Problem	Cause	Remedy	Page
2. Coarse/Fine Adjustment			
a. The coarse adjustment knob is hard to turn.	The tension adjustment ring is over-tightened.	Loosen the ring.	13
	You are trying to raise the stage with the coarse adjustment knob even though the pre-focusing lever is locked.	Unlock the pre-focusing lever.	13
b. The stage drifts down by itself, or focus is lost during observation.	The tension adjustment ring is too loose.	Tighten the ring.	13
c. Coarse adjustment will not go all the way up.	The pre-focusing lever is keeping the stage down.	Unlock the pre-focusing lever.	13
d. Coarse adjustment will not go all the way down.	The condenser holder is too low.	Raise the condenser holder.	—
e. The objective makes contact with the specimen before focus is obtained.	The specimen is mounted upside-down.	Mount the specimen correctly.	10,11
3. Observation Tube			
a. Field of view of one eye does not match that of the other.	The interpupillary distance is incorrect.	Adjust the interpupillary distance.	11
	Incorrect diopter adjustment.	Adjust the diopter.	11
	Different eyepieces are used on the left and right.	Change one eyepiece to match the other so that both sides are the same.	—
	The optical axes are not parallel.	Upon looking into the eyepieces, try looking at the overall field before concentrating on the specimen range. You may also find it helpful to look up and into the distance for a moment before looking back into the microscope.	—
4. Stage			
Image blurs as you move the specimen.	The specimen is not correctly positioned on the stage.	Mount the specimen correctly.	—
5. Objective Change			
Front lens of a high power objective comes into contact with specimen when it is engaged after a low power objective.	Specimen is mounted upside-down.	Mount the specimen correctly.	10,11
	Cover glass is too thick.	Use a 0.17 mm thick cover glass.	11
6. Electrical System			
a. The bulb does not light.	Bulb is not mounted.	Mount the designated bulb.	3
	The bulb is burned out.	Replace the bulb.	3
	The power cord plug is not connected.	Connect the power cord.	5,6
b. The bulb is dark.	The voltage selector switch is set incorrectly.	Set the switch to match the local AC mains.	i
c. The bulb burns out almost immediately.	Wrong type of bulb used.	Use the correct bulb type.	3
	The voltage selector switch is set incorrectly.	Set the switch to match the local AC mains.	i

9 OPTIONAL UNITS

Optional Unit	Application	Remarks
Brightfield/darkfield phase contrast attachment CH2-PCD	Centration of phase contrast insert possible. Centration of field iris diaphragm not possible.	
Dry darkfield condenser BH-DCD	Centration of darkfield field of view possible by using the centering knobs of the condenser.	
Phase contrast attachment BH2-PC	Centration of phase contrast insert possible. Centration of field iris diaphragm not possible.	
Simple polarizing light attachment set CH3-POL (Contains) Condenser CH3-CDP Analyzer CH3-AN Polarizer U-POT	The CH3-POL is provided with the CH40. Attaching the compensating lens below the CH3-CDP allows centration of the field iris diaphragm.	★ **The standard condenser does not allow polarized light observation.** In case of CH30, centration of the field iris diaphragm becomes possible if the compensating lens and field iris diaphragm attachment are added.

This device complies with the requirements of both directive 89/336/EEC concerning electromagnetic compatibility and directive 73/23/EEC concerning low voltage. The CE marking indicates compliance with the above directives.

■ PROPER SELECTION OF THE POWER SUPPLY CORD

If no power supply cord is provided, please select the proper power supply cord for the equipment by referring to "Specifications" and "Certified Cord" below:

CAUTION: **In case you use a non-approved power supply cord for Olympus products, Olympus can no longer warrant the electrical safety of the equipment.**

Specifications

Voltage Rating	125V AC (for 100–120V AC area) or, 250V AC (for 220–240V AC area)
Current Rating	6A minimum
Temperature Rating	60°C minimum
Length	3.05 m maximum
Fittings Configuration	Grounding type attachment plug cap. Opposite terminates in molded-on IEC configuration appliance coupling.

Table 1 Certified Cord

A power supply cord should be certified by one of the agencies listed in Table 1, or comprised of cordage marked with an agency marking per Table 1 or marked per Table 2. The fittings are to be marked with at least one of agencies listed in Table 1. In case you are unable to buy locally in your country the power supply cord which is approved by one of the agencies mentioned in Table 1, please use replacements approved by any other equivalent and authorized agencies in your country.

Country	Agency	Certification Mark	Country	Agency	Certification Mark
Australia	SAA		Italy	IMQ	
Austria	ÖVE		Japan	MITI	
Belgium	CEBEC		Netherlands	KEMA	
Canada	CSA		Norway	NEMKO	
Denmark	DEMKO		Spain	AEE	
Finland	FEI		Sweden	SEMKO	
France	UTE		Switzerland	SEV	
Germany	VDE		United Kingdom	ASTA BSI	
Ireland	NSAI		U.S.A.	UL	

Table 2 HAR Flexible Cord

APPROVAL ORGANIZATIONS AND CORDAGE HARMONIZATION MARKING METHODS

Approval Organization	Printed or embossed Harmonization Marking (May be located on jacket or insulation of internal wiring)	Alternative Marking Utilizing Black-Red-Yellow Thread (Length of color section in mm)		
		Black	Red	Yellow
Comite Electrotechnique Belge (CEBEC)	CEVEC <HAR>	10	30	10
Verband Deutscher Elektrotechniker (VDE) e.V. Prüfstelle	<VDE> <HAR>	30	10	10
Union Technique de d'Electricite' (UTE)	USE <HAR>	30	30	10
Instituto Italiano del Marchio di Qualita' (IMQ)	IEMMEQU <HAR>	10	30	50
British Approvals Service for Electric Cables (BASEC)	BASEC <HAR>	10	10	30
N.V. KEMA	KEMA-KEUR <HAR>	10	30	30
SEMKO AB Svenska Elektriska Materielkontrollanstalter	SEMKO <HAR>	10	10	50
Österreichischer Verband für Elektrotechnik (ÖVK)	<ÖVE> <HAR>	30	10	50
Danmarks Elektriske Materielkontrol (DEMKO)	<DEMKO> <HAR>	30	10	30
National Standards Authority of Ireland (NSAI)	<NSAI> <HAR>	30	30	50
Norges Elektriske Materiellkontroll (NEMKO)	NEMKO <HAR>	10	10	70
Asociacion Electrotecnica Y Electronica Espanola (AEE)	<UNDE> <HAR>	30	10	70
Hellenic Organization for Standardization (ELOT)	ELOT <HAR>	30	30	70
Instituto Portugues da Qualidade (IPQ)	| np | <HAR>	10	10	90
Schweizerischer Elektro Technischer Verein (SEV)	SEV <HAR>	10	30	90
Elektriska Inspektoratet	SETI <HAR>	10	30	90

Underwriters Laboratories Inc. (UL)	SV, SVT, SJ or SJT, 3 X 18AWG
Canadian Standards Association (CSA)	SV, SVT, SJ or SJT, 3 X 18AWG

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