INSTRUCTIONS

IX50/IX70

INVERTED SYSTEM MICROSCOPE
The IX system comprises two basic microscope frames, the IX50 and the IX70. Various modules, such as illumination column, stages, condensers, etc. are available for upgrading the system. This instruction manual introduces the basic system. Explanations relating to particular modules are preceded by a heading stating the name of the module. Please study carefully the relevant sections dealing with the modules you have already purchased.

This IX50 and IX70 units feature a UIS (universal infinity system) optical design, and should be used only with UIS eyepieces, condensers, etc. Less than optimum performance may result if inappropriate accessories are used.

1. Getting Ready

(Figs. 1, 2, 3, 4)

1. Before use, using the Allen wrench provided with the microscope frame, loosen the screw (1) securing the clamping rod holding the focusing controls clamped to protect them during transport. (Fig. 1)

2. Remove the screw and the caution tape (2) around the focusing adjustment knobs. Then rotate the coarse adjustment knob counterclockwise (in the direction of the arrow), and remove the rod (3) holding the focusing controls. (Fig. 1)

When moving the microscope, insert a thick sheet of paper, etc. into the space left by the clamping rod between the revolving nosepiece and the dummy cover (or cube cassette) and turn the coarse adjustment knob clockwise to prevent the focusing block from moving.

* Never attempt to turn the coarse adjustment knob clockwise while the rod for clamping the focus controls remains in place.

3. A microscope is a precision instrument. Handle it with care and avoid subjecting it to sudden or severe impact.

4. When moving the microscope, grip at the designated position (4) and the handle (5) on the illumination column IX-ILL100 (the IX-ILL30 has a groove instead of the handle). (Fig. 2)

5. Before moving the stage, clamp the flexible knob to prevent it from being damaged.

6. The designated bulb is a 12V100W halogen bulb in case of the illumination column IX-ILL100LH, and a 6V30W halogen bulb in case of the IX-ILL30.

7. Do not use the microscope where it is subjected to direct sunlight, high temperature and humidity, dust or vibrations. For operation environment conditions, see "SPECIFICATIONS" on page 53.

8. Always use the tension adjustment ring to adjust the tension of the coarse adjustment knob.

9. Make sure that the line voltage selector switch located at the rear of the microscope is set to conform with the local mains voltage.

© When shipped from the factory, the switch is set to 200-240V.

10. The lamp housing and the area in the vicinity of it will become very hot during operation. When installing the microscope, ensure that there is ample free space around and in particular above the lamp housing.

11. To avoid potential shock hazard, make sure that the power cord is properly grounded.

12. Always turn OFF the main switch and disconnect the power cord before replacing the fuses.

© Before replacing fuses, set the main switch on O (OFF) and unplug the power cord. (The power cord should be unplugged from the AC receptacle to allow removal of the fuse holder.)
The designated bulb is a 6V, 30WHAL-L halogen bulb (Philips 5761).

1. Holding the bulb ① with a piece of gauze to avoid touching it directly with bare hands, insert the bulb pins ② fully into the pin holes ③ of the lamp socket. (Fig. 9)

   * Do not touch the bulb with bare hands. If fingerprints are accidentally left on the bulb, wipe it with a piece of soft cloth.

2. Insert the plug ④ into the socket pin ⑤. Then align the guide pins ⑥ with the guide holes ⑦ on the illumination column, and gently place the lamp socket on the illumination column. (Fig. 10)

   * Whenever you replace the bulb, first turn OFF the main switch, disconnect the power cord, and wait for bulb, lamp socket and lamp housing to cool.

3. Plug the connecting cord plug ⑧ firmly into the lamp power output connector ⑨ on the rear of the microscope frame. (Fig. 11)

   * The lamp housing and the area in the vicinity of it will become very hot during operation. Ensure that there is ample free space around and in particular above the lamp housing.
Attaching the Scales

- Scales for use with a 96-well microtiter plate are provided with the attachable mechanical stage.

1. Loosen the two clamping knobs (3) at the top of the stage's X-axis guide. Positioning the scale numerals correctly, place the X-axis scale (7) on the guide. Then tighten the clamping knobs. (Fig. 16)

2. Positioning the scale numerals correctly, place the Y-axis scale (3) on the top of the stage's Y-axis guide. The scale will be held in place magnetically.

Mounting the Stage Extender Plates (CKS2-SS)

- Mount these plates in the same manner as outlined in "Mechanical Stage (IX-MVR)" above.

- When the mechanical stage is not used, a stage extender plate (3) can be mounted at both sides of the plain stage. (Fig. 17)

Mounting the Positioning Bracket

- Flexible stalks for the coaxial X-Y movement knobs are employed in the case of the stage (IX-SFR) and the attachable mechanical stage (IX-MVR). These stalks are provided with a positioning bracket that allows the tilt of the stalk to be adjusted to suit the observer's preference.

Stage (IX-SFR) (Figs. 18, 19)

1. Insert the stalk (2) of the flexible X-Y movement knobs into the U-shaped notch in the positioning bracket (1). (Fig. 18)

2. Using the Allen screwdriver, tighten the clamping screw (3) of the bracket lightly to the stage.

3. Align the stage's center alignment index line (2) with the edge of the upper stage (3). (Fig. 19)

4. Slide the positioning bracket to and fro in order to determine the most convenient stalk angle.

5. Tighten the clamping screw (3).

Attachable Mechanical Stage (IX-MVR)

- Is attached in the same manner as outlined in "Stage (IX-SFR)" above. The attachable mechanical stage, however, is not provided with a stage center alignment index line. Instead turn the Y-axis travel knob to bring the stage into the center.
4. While depressing the spring ③ on the inward side of the turret aperture with the side of the phase contrast ring slit mount ③, insert the phase contrast ring slit completely until it sits firmly on the bottom of the turret aperture. (Fig. 24)
   ★ Be careful not to press against the ring slit glass plate in its mount.

5. Turn the turret insert centering wrenches clockwise to tighten lightly.
   ★ If the centering wrenches are engaged, the turret cannot be rotated.
   ★ Do not tighten the centering wrenches excessively as this may deform the insert mount.

6. Attach the index sticker ② which comes with the insert at the index number ③ position that corresponds to the number ③ into which the turret insert was placed. (Fig. 25, 26)
   ○ The turret insert corresponding to the number indicated by the • symbol ⑥ is engaged into the light path.
   ○ Remove the turret insert index sticker with the tip of ball-pen or mechanical pencil.

7. When all the turret inserts have been mounted, mount the cover and tighten the two clamping screws.

(Mounting the Differential Interference Contrast Prism Insert)
1. Follow steps 1, 2, and 3 in the above paragraph.

2. Aligning the positioning dot ③ of the DIC prism insert with the positioning dot ⑤ of the turret aperture, drop the DIC prism insert into the turret aperture as far as it will go in a manner so that the positioning pin of the DIC prism insert fits into the pin hole. Slightly depress the spring ⑥ on the inward side of the turret aperture with the side of the DIC prism insert mount when inserting. (Fig. 27)
   ★ Be careful not to touch the prism in its mount.
   ★ Do not tighten the centering wrenches excessively as this may deform the prism mount.

3. Follow steps 5, 6, and 7 in the above paragraph.
Condenser (IX-SLWCD) (Figs. 32, 33, 34)

- This condenser is only for use with the illumination column (IX-ILL30). It consists of a slider and a condenser lens.

Mounting the Condenser

1. If the condenser (IX-ULWCD) mounting adapter is mounted to the arm of the illumination column, rotate the adapter counterclockwise and remove it.

2. Insert the threaded portion of the condenser ① into the illumination column and turn the lens in the direction of the arrow until it comes up against the bracket and is firmly seated. (Fig. 32)

Installing the Ring Slit Slider

- Insert the slider into the illumination column (IX-ILL30).

1. Remove the dummy slider from the slider slot on the illumination column. (Fig. 33)

2. Drop the frosted filter ④ provided with the illumination column into the center aperture ③ of the ring slit slider ②. (Figs. 33, 34)

3. With the imprinted side of the ring slit slider ② upwards, and the V-groove for the click function towards the rear, insert the slider into the slot. (Fig. 33)
Mounting the Observation Tube

(Figs. 38, 39, 40, 41)

Binocular Tube (U-B190CT, U-B190)  
(Figs. 38, 39)

1. Using the Allen screwdriver, loosen the observation tube clamping screw ① on the observation tube mount. (Fig. 38)

2. Insert the circular dovetail mount of the observation tube into the observation tube mount, placing the observation tube so that the interpupillary distance scale numbers ② are seen right side up. Clamp the observation tube by tightening the clamping screw ①.

③ Normally, the distance from the surface of the desk to the eyepoint is approximately 430 mm. If it is desirable to lower the eyepoint position, the observation tube may be detached, turned 180° and then mounted on the observation tube mount again. Eyepoint height will be lowered approximately 30 mm by this procedure. (Fig. 39)

Trinocular Tube (U-TR30H)  
(Figs. 40, 41)

③ First mount the intermediate tube (IX-ATU).

1. Using the Allen screwdriver, loosen the observation tube clamping screw ① on the observation tube mount. (Fig. 40)

2. Insert the circular dovetail mount of the intermediate tube into the observation tube mount, placing the intermediate tube so that its upper surface is flush with the microscope frame. Clamp the intermediate tube by tightening the clamping screw ①.

3. Using the Allen screwdriver, loosen the observation tube clamping screw ② on the intermediate tube's observation tube mount. (Fig. 41)

4. Insert the circular dovetail mount of the observation tube into the opening on the intermediate tube, placing the observation tube to point the binocular eyepieces towards the front. Clamp the observation tube by tightening the observation tube clamping screw ②.
11 Connecting the Power Cord  

⚠ Check that the main switch ① is in the OFF position. Cables and cords are vulnerable when bent or twisted. Never subject them to excessive force.

1. Before shipment from factory, the voltage selector switch ② is set to the 200-240V position. In case your local line voltage is 100-120V, move the switch to the 100-120V position using a flat-blade screwdriver.

⚠ 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.

2. Plug the power cord plug ③ into the AC receptacle ④ on the microscope frame.

3. Plug the power cord plug into a wall outlet.

⚠ Connect the power cord correctly and ensure that the ground terminal of the microscope 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.

12 Mounting Accessories Such As Micromanipulator  

◎ Eight tapped holes ① are provided on the microscope frame for mounting accessories, such as a micromanipulator, etc. These holes are covered with plastic dust caps. To remove the caps, insert the tip of a flat-blade screwdriver sideways into the space between the cap and the frame.

☆ The applicable screw is M6. The screws can be inserted into the microscope frame up to a depth of 10 mm. Select the screw length in accordance with this.
4.1 Brightfield/Phase Contrast Observation

(Microscope Frame IX70, Illumination Column 100W Configuration)

**Preparation**
- Confirm that the frosted filter is inserted.
- Lower the revolving nosepiece.
- Filter holder
- Coarse adjustment knob
  
  p. 32
  p. 24

Turn ON the main switch.
- Main switch
  
  p. 22

- Confirm that the light-off switch is not activated.
- Light-off switch
  
  p. 23

- Rotate the light path selector dial to "<".
  
  p. 23

- When using trinocular observation tube, move the light path selector knob to 100% for binocular eyepieces.
  
  Trinocular observation tube
  
  p. 29

Place the specimen.

Engage the 10X objective.
- Turret condenser
- Aperture iris diaphragm
  
  p. 37

Interpupillary distance adjustment
- Binocular eyepieces
  
  p. 28

Diopter adjustment
- Diopter adjustment
- Eye piece helicoid
  
  p. 28
  p. 28

Bring the specimen into focus.
- Coarse and fine adjustment knob
  
  p. 24

Stop down and bring the field iris diaphragm image into focus by adjusting the condenser height. Center the condenser and open the field iris diaphragm image so that it circumscribes the observed area.
- Condenser height adjustment knob
- Condenser centering knobs
  
  p. 35
  p. 34

Engage the objective to be used.
- Turret condenser

For phase contrast observation, rotate the condenser turret to engage the ring slit that matches the objective in use.
- Ring slit slider
- Centering screws and CT
  
  p. 36

Bring the specimen into precise focus.
- Coarse and fine adjustment knob
  
  p. 24

Adjust the correction collar of 40X, or 60X objectives according to the thickness of the vessel bottom.
- Objective correction collar
  
  p. 39

Adjust the light intensity.
- Light intensity lever
  
  p. 22

For brightfield observation, adjust the aperture iris diaphragm. For phase contrast observation, open the aperture iris diaphragm.
- Aperture iris diaphragm lever on turret condenser
  
  p. 37

Engage the filter(s) to be used.
- Filter holder
  
  p. 32
4-3 Transmitted Light Nomarski DIC Observation

(When Using Universal Condenser IX-LWUCD)

**Preparation**
- Remove analyzer, polarizer, transmitted light differential interference contrast prism (U-DICT) from the light path.
- Turret condenser Analyzer, U-DICT p. 41
- Filter holder Coarse adjustment knob p. 32
- Lower the revolving nosepiece.
- Main switch p. 24
- Light-off switch p. 22
- Light path selector dial (IX70) Light path selector lever (IX50) p. 23
- When using trinocular observation tube, move the light path selector knob to 100% for binocular eyepieces.
- Trinocular observation tube p. 29

**Turn ON the main switch.**
- Place the specimen.
- Engage the 10x objective.

**Rotate the condenser turret to the “BF” position. Stop down the aperture iris diaphragm for low contrast specimens.**
- Interpupillary distance adjustment Binocular observation tube p. 28
- Diopter adjustment Eyepiece helicoid p. 28
- Bring the specimen into focus.
- Stop down and bring the field iris diaphragm image in focus by adjusting the condenser height. Center the condenser and open the field iris diaphragm image so that it circumscribes the observed area.
- Condenser height adjustment knob Condenser centering knobs p. 35
- Engage the analyzer and polarizer.
- Polarizer rotation knob p. 42

**Adjust until complete extinction is obtained (“crossed Nicols” position).**
- Engage the objective to be used.

**Rotate the condenser turret to engage the DIC optical element that matches the objective in use.**
- Coarse and fine adjustment knob p. 24

**Bring the specimen into precise focus.**
- Adjust the correction collar of 40x or 60x etc. objectives according to the thickness of the vessel bottom.
- Objective correction collar p. 39

**Adjust the light intensity.**
- Light intensity lever p. 22

**Adjust the aperture iris diaphragm.**
- Aperture iris diaphragm on turret condenser p. 37

**Observation**
3 Light Path Selection

(Figs. 51, 52)

**Microscope Frame (IX70)**

![Fig. 51](image)

Select the light path by rotating the light path selector dial ① to the position indicating the desired observation method.

<table>
<thead>
<tr>
<th>Dial position symbol</th>
<th><img src="image" alt="Light path symbol" /></th>
<th><img src="image" alt="Light path symbol" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>Light path</td>
<td><img src="image" alt="Light path symbol" /></td>
<td><img src="image" alt="Light path symbol" /></td>
</tr>
<tr>
<td>Side port</td>
<td><img src="image" alt="Light path symbol" /></td>
<td><img src="image" alt="Light path symbol" /></td>
</tr>
<tr>
<td>Binocular eyepieces</td>
<td>20%</td>
<td>100%</td>
</tr>
<tr>
<td>SLR port</td>
<td>80%</td>
<td><img src="image" alt="Light path symbol" /></td>
</tr>
</tbody>
</table>

Brackets () indicate microscope frame IX70-S1F.

- A vibration damping mechanism is employed to ensure that vibration is reduced to an absolute minimum during light path change provided the light path selection dial is rotated slowly.
- The side port can be used for mounting photometric equipment, a camera unit via a straight photo tube, or a video-camera via a video-adapter.

**Microscope Frame (IX50)**

![Fig. 52](image)

Turn the light path selector lever ① to the position indicating the desired observation method.

<table>
<thead>
<tr>
<th>Lever position symbol</th>
<th><img src="image" alt="Light path symbol" /></th>
<th><img src="image" alt="Light path symbol" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>Light path</td>
<td><img src="image" alt="Light path symbol" /></td>
<td><img src="image" alt="Light path symbol" /></td>
</tr>
<tr>
<td>Side port</td>
<td><img src="image" alt="Light path symbol" /></td>
<td><img src="image" alt="Light path symbol" /></td>
</tr>
<tr>
<td>Binocular eyepieces</td>
<td>100%</td>
<td>80% (100%)</td>
</tr>
</tbody>
</table>

Brackets () indicate microscope frame IX50-S1F.

- The side port can be used for mounting photometric equipment, a camera unit via a straight photo tube, or a video-camera via a video-adapter.

4 Magnification Change

(Fig. 53)

**Microscope Frame (IX70)**

When the magnification selector knob ① is pulled out, the magnification will be 1.5X. When the knob is pushed in, the magnification will be 1X.

- When using the IX-CA2X, and depending on the ambient temperature, defocusing may occur when the magnification is changed. Refocus as required.
- When observing with the IX-CA2X, slight vignetting may occur at the periphery of the field of view. Vignetting will disappear if used in combination with the IX-EPA.

**Microscope Frame (IX50)**

When the magnification selector knob ① is pulled out, the magnification will be 1.5X. When the knob is pushed in, the magnification will be 1X.

- When using the IX-CA2X, and depending on the ambient temperature, defocusing may occur when the magnification is changed. Refocus as required.
- When observing with the IX-CA2X, slight vignetting may occur at the periphery of the field of view. Vignetting will disappear if used in combination with the IX-EPA.
5-3 Stage

1 Specimen Placement  (Figs. 57, 58, 59, 60, 61)

**Stage (IX-SFR, IX-SVL)**  (Fig. 57)

Place the specimen in the center of the stage.
- In the case of a slide glass specimen, place the specimen with the cover glass facing down.
- If the specimen is prone to slide on the stage, attach the stage clips (U-SCL) ① to the stage and clamp the specimen down with the clips.

**Mechanical Stage (IX-MVR)**  (Fig. 58, 59, 60, 61)

- 96-well and 24-well microtiter plates, etc. are held in place by the specimen holder. Microtiter plates with dimensions of max. 136 mm x 92 mm can be accommodated in this way.

1. Open the spring-loaded finger of the specimen holder ① and slide the microtiter plate into the holder frame. Gently release the curved finger to clamp. (Fig. 58)

- To secure other vessels than microtiter plates, various optional holders are available. A Terasaki plate holder ② is available for holding Terasaki plates (72-well, 60-well).

When using this it necessary to replace the stage scales with those provided with the plate holder. Petri dish holder ③ is available for 35 mm, 54 mm, and 60 mm diameter Petri dishes, and a slide glass holder ④ is available for holding slide glass. (Fig. 59)
3 Connecting the Grounding Wire Stage (Fig. 63)

Stage (IX-SFR, IX-SVL)

A grounding wire can be attached to the stage for electrophysiological experiments, etc.
Prepare a grounding wire ① and one M4 screw ②, and attach the wire as shown in the Fig. 63.
★ The screw hole may be covered by a paint covering, etc. Therefore, before fastening the grounding wire, screw in and unscrew the M4 screw several times until the screw hole's metal portion is exposed. Then tighten the screw to put the grounding wire in firm contact with the stage.

4 Adjusting the Tension of X-axis and Y-axis knobs (Fig. 64)

Stage (IX-SVL)

The tension of the X-axis and Y-axis knobs can be individually adjusted.
1. Using the provided Allen wrench, loosen the two set screws ①. While holding the stage stationary, turning the knob in the direction of the arrow increases tension, and turning it in the opposite direction reduces tension.
2. After adjusting the tension, tighten the two set screws again.
★ If the tension is adjusted too tight, or too loose, the image may jump or show backlash during stage travel.
Microscope Frame (IX-50) (Figs. 69, 70)

1. Looking through the helicoid eyepiece, turn the diopter adjustment ring \( \circ \) until the periphery of the field of view is sharp. (Fig. 69)

\( \circ \) Diopter adjustment can also be performed when eyepiece micrometers are used.

2. Looking through the helicoid eyepiece, rotate the coarse and fine adjustment knobs \( \circ \) to bring the specimen into focus. (Fig. 70)

3. Looking through the other eyepiece, turn the diopter adjustment ring \( \circ \) on the eyepiece sleeve to focus on the specimen. (Fig. 69)

\* When turning the eyepiece diopter adjustment ring, use your other hand to hold the lower part of the eyepiece stationary.

Observation Tube Light Path Selection (Fig. 71)

### Trinocular Observation Tube (U-TR30H)

Slide the light path selector knob \( \circ \) to select the desired light path.

\( \circ \) The selector knob is ordinarily at the middle position. With dark specimens, push the knob in. If additional light is needed for television or photomicrography, pull the knob out.

<table>
<thead>
<tr>
<th>Light path selector knob</th>
<th>Symbol</th>
<th>Intensity ratio</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pushed in</td>
<td>![symbol]</td>
<td>100% for bipocular eyepieces</td>
<td>Observation of dark specimens</td>
</tr>
<tr>
<td>Middle position</td>
<td>![symbol]</td>
<td>20% for binocular eyepieces, 80% for TV/photography</td>
<td>Observation of bright specimens, photography, TV observation</td>
</tr>
<tr>
<td>Pulled out</td>
<td>![symbol]</td>
<td>100% for TV/photography</td>
<td>Photography, TV observation</td>
</tr>
</tbody>
</table>
5.5 Illumination Column

1. Tilting the Illumination Column

(Fig. 74)

<table>
<thead>
<tr>
<th>Illumination Column (IX-ILL100LH)</th>
</tr>
</thead>
</table>

© When replacing large specimens, placing a micromanipulator, or replacing a patch clamp electrode, working space can be created by tilting the illumination column.

© Even with the illumination column tilted, the specimen surface will be illuminated, which is convenient for rough confirmation of the specimen location or initial positioning when placing the specimen.

1. Using the Allen screwdriver, loosen the column tilt clamping screw by rotating it approximately 11 rounds in the direction of the arrow.

2. Holding the illuminator attachment’s upper front side, slowly tilt the illumination column backward. Vibrations should be avoided. Accordingly, always support the illumination column with a hand and tilt slowly and gently. To return the column to its original position, reverse this procedure.

★ If the reflected light illuminator attachment is mounted, and the condenser holder is left rotated to the back of the column, the condenser holder will contact the reflected light illuminator attachment lamp housing if the illumination column is tilted. Accordingly, do not attempt to tilt the illumination column while the condenser holder remains situated at the back of the column.

★ When tilting the illumination column upwards or downwards, make sure not to catch your fingers in the hinge joint.

★ The tilt clamping screw should normally be tightened during use. If the microscope is used while the screw is loosened, make sure that the illumination column does not accidentally tilt during use.

★ When moving or transporting the microscope, always do so with the tilt clamping screw tightened.
3 Using the Field Iris Diaphragm (Figs. 79, 80)

**Illumination Column (IX-ILL100LH)**

- The field iris diaphragm lever ① is used to adjust the diameter of the illuminating beam in accordance with the objective in use. Adjust the diaphragm so the field of view is circumscribed by the field iris diaphragm to exclude stray light.
- To limit specimen damage or fading when observing living cells or fluorescent specimens, the field iris diaphragm may be stopped down.

The field iris diaphragm can be opened/closed by moving the field iris diaphragm lever ① rightward/leftward.

**Illumination Column (IX-ILL30)**

Is not provided with a field iris diaphragm. (It has a fixed diaphragm.)
For operation of the U-UCDB, refer to the provided instruction manual (BX-UCDB).

Since this condenser is used in its inverted condition, the turret inserts may fall out if the condenser is subjected to shock or impact. In particular, be careful when tilting the condenser holder.

**Illumination Column (IX-ILL100LH)**

1. Loosen the condenser height fine adjustment knob ① by turning it counterclockwise. Then push it all the way to the rear.

2. Rotate the condenser height adjustment ① in the direction of the arrow to lower the condenser to its lowest position.

3. Rotate the turret ⑤ to select the “BF” brightfield observation setting (no optical element engaged).

4. Turn the aperture iris diaphragm lever ② to open the diaphragm.

5. Move the field iris diaphragm lever ③ to the fully open position (©→⑤).

6. Engage the 10X objective and bring the specimen into focus.

7. Using the field iris diaphragm lever, stop down the field iris diaphragm until its image is just inside the field of view.

8. Slowly move the condenser height fine adjustment knob ① to the front to bring the field iris diaphragm image into focus. When the image is in focus, clamp the knob by turning it clockwise.

9. While gradually opening the field iris diaphragm image, rotate the condenser holder's condenser centering knobs ② to adjust so that the field iris diaphragm image is centered in the eyepiece field of view.

10. 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 the condenser again.

© When used for actual observation, open the field iris diaphragm until its image just circumscribes the field of view.

© When replacing the specimen or applying oil, use the condenser height adjustment knob to first raise the condenser and then lower it to its lowest position. If this is done, it should be unnecessary to adjust the condenser centration or focus again.
3 Using the Aperture Iris Diaphragm

In general, the potential resolving power of an objective is fully utilized if the diaphragm is stopped down to correspond with the numerical aperture (N.A.) of the objective.

Depending on the specimen, image contrast may be improved, or focus depth increased, by keeping the aperture iris diaphragm stopped down a little during observation or photomicrography. In general, a good image is obtained if the diaphragm is stopped down to 70-80% of the numerical aperture of the objective. Stop further down for less contrasty specimens.

To check the position of the aperture iris diaphragm, remove the eyepieces. Looking through the eyepiece sleeves, the aperture iris diaphragm image and the objective’s exit pupil can be seen.

When using the binocular observation tube (U-B190CT), and setting the turret to "CT", or when using a focusing telescope (U-CT30), the aperture iris diaphragm can be observed in the same way.

4 Adjusting the Tension of the Condenser Height Adjustment Knobs

The tension of the condenser height adjustment knobs is preadjusted for easy use. However, if desired you can change the tension. Holding the right condenser height adjustment knob stationary with the right hand, rotate the left condenser height adjustment knob until the tension of the knobs is as desired.

5 Tilting the Condenser Holder

To create working space and facilitate specimen replacement, micro-manipulator positioning, or mounting, an objective through the hole in the stage, tilt the condenser holder upwards.

1. Placing a hand against the bottom of the condenser holder, press upwards.

2. The tension of the tilt can be adjusted by rotating the adjustment screw using a turret insert centering wrench or the shank of the Allen screwdriver.
   - Adjust the tension so that the tilted condenser will not drop down by itself.
   - When returning a tilted condenser to its original position, do so gently and slowly.
5-7 Objectives

1. Correction Caps for Objectives (Fig. 91)

The following objectives can be used with correction caps. By attaching the caps in accordance with the bottom thicknesses of various vessels, optimum performance is obtainable with glass vessels, and plastic vessels.

<table>
<thead>
<tr>
<th>Brightfield/Differential Interference</th>
<th>Phase contrast/Brightfield</th>
<th>Correction collar</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCPLFL20X</td>
<td>LCPLFL20XPh</td>
<td>None</td>
</tr>
<tr>
<td>LCPLFL40X</td>
<td>LCPLFL40XPh</td>
<td>Available</td>
</tr>
<tr>
<td>LCPLFL60X</td>
<td>LCPLFL60XPh</td>
<td>Available</td>
</tr>
</tbody>
</table>

Provided as standard accessory
Correction cap: CAP-G1.2

* As shown in the above table, the brightfield/differential interference objectives are delivered with the correction cap "CAP-G1.2" for use with glass vessels, and the phase contrast/brightfield objectives are delivered with the "CAP-P1.1" as standard accessory. Confirm the compatibility of the culture vessel in use.

2. Correction Collar Adjustment

1. The correction collar is effective with 0 to 2.5 mm thick vessel bottom thicknesses. If the thickness of the vessel bottom is known, match the correction collar to the thickness of the vessel bottom by using the scale.

2. How to find the optimum position for optimum image resolution and contrast.

- If the thickness of the vessel bottom is unknown, the optimum position for the correction collar can be obtained by judging the image resolution. When a satisfactory image is not obtained after focusing, rotate the correction collar to the right or the left and refocus to compare the image at both sides. Return the collar to the position yielding the improved image, then starting from this position, further rotate the collar slightly to the right or left, refocusing each time, to compare the image at each position. Repeat this procedure until the position with the optimum image is obtained.
6-1 Differential Interference Contrast Observation

**Universal Condenser (IX-LWUCD)** (Figs. 93 – 95)

«Installing and Adjusting the Analyzer and Polarizer»

1. Remove the dummy slider from the revolving nosepiece.

2. Align the analyzer (U-ANT) 1 and place it into the opening in the transmitted light differential interference contrast slider (U-DICT) 2. (Fig. 93)

3. Insert the transmitted light differential interference contrast slider (U-DICT) 2 with the analyzer facing downwards and engage it into the light path. Turn the clamping knob 3 to clamp. (Fig. 94)

☐ When using the IX-AN analyzer 4, insert it into the slider slot 5 under the revolving nosepiece. Insert as far as the click-stop. In this case, the analyzer U-ANT is not used. (Figs. 94, 95)

☐ When performing simultaneous reflected light fluorescence and transmitted light observation, using the IX-AN analyzer will prevent decreased excitation light intensity and make observation of bright images possible.

4. Rotate the condenser turret 2 to select the “BF” brightfield observation light path (no optical element in the light path) (Fig. 96).

5. To engage the polarizer into the light path, move the polarizer lever 6 on the polarizer unit (IX-LWPO) to the right.

6. Engage the 10X objective and place a specimen suitable for brightfield observation on the stage. After bringing the specimen into approximate focus, remove the specimen from the light path.
6-2 Simple Polarized Light Observation

Universal Condenser (IX-LWUCD) (Figs. 99, 100)

1. Remove the dummy slider from the revolving nosepiece.

2. Align the index ① of analyzer (U-ANT) with the groove ② in the dummy slider, and place it into the opening. (Fig. 99)

3. Invert the dummy slider with the mounted analyzer and insert it into the slot under the revolving nosepiece. Insert as far as the click-stop.

4. Rotate the turret ③ to select the "BF" brightfield observation light path (no optical element in the light path). (Fig. 100)

5. To engage the polarizer into the light path, move the polarizer lever ⑨ on the polarizer unit (IX-LWPO) to the right.

6. Engage the objective to be used.

7. Loosen the polarizer rotation/clamping knob ⑦ a little by rotating it counterclockwise. Move it horizontally until the total extinction position is obtained.

8. When the position of the polarizer is determined, tighten the polarizer rotation/clamping knob to clamp the polarizer.

9. Place the specimen on the stage and bring it into focus. Simple polarized light observation can now be performed.

10. Adjust the field iris diaphragm until the diaphragm opening circumscribes the field of view.

11. Stopping down the aperture iris diaphragm somewhat will increase the contrast.
3 Mounting the Camera Unit (Fig. 104)

- Place the camera unit directly over the circular dovetail of the straight photo tube. Make sure the index dots \(0\) on the straight photo tube and the camera unit are aligned, then clamp the unit.
- Mount to the side port in the same manner.
- For details on mounting the SC35 camera to the SLR port, refer to page 14.

4 Selecting the Observation Tube Light Path

See page 29 of the “Observation Tube” section.

5 Using the Photo Mask (Figs. 105, 106)

Microscope Frame (IX70)

Pull out the photo frame \(0\) to engage the photo mask into the light path for observation. (Fig. 105)

- If the photo frame is pulled further out than when placed in the light path for observation, the photo mask slider can be removed from the microscope frame, and dirt or other contaminants can be cleaned off. When mounting the slider, do so with the inscription on the slider facing towards the observer and the positioning pin fitting into the positioning groove.

- The cross-lines in the center of the photo mask are used for eyepiece diopter adjustment.

- The mask indicates the areas covered when using a 35mm film, and the numerals next to the lines correspond to the magnification of the respective PE photo eyepiece. (Fig. 106)

- When using 4'X3' film, the photographed area will be one step smaller than the 35 mm film reticles.

- When using the SLR port for photography, a 2.5X photo magnification will be effective. Accordingly, use the 2.5 masks. The built-in 2.5X photo eyepiece may be replaced with another of different magnification (4X, 5X).

Contact the nearest Olympus service center for details.

Microscope Frame (IX50)

This microscope frame is not equipped with a photo frame.
Microscope Frame (IX50)

To adjust focus when using this microscope frame, attach a finder eyepiece to the eyepiece portion of the trinocular observation tube, or use the focusing telescope on the camera unit. When the camera unit is attached to the side port, it is not possible to focus using the 35WH10X. Use the camera unit's focusing telescope. If it is difficult to use the focusing telescope, it is recommended to use a V-shaped focusing telescope (U-FTV).

* Note that the finder eyepiece 35WH10X cannot be attached to the binocular tubes U-B190CT, U-B190.

7 Adjusting the Illumination

Correct illumination is more crucial for photomicrography than for observation since flawless pictures cannot be obtained unless the illuminating light is properly adjusted. To avoid uneven illumination, especially with high contrast film, adjust the illuminating light by carefully following the observation procedures.

8 Radiant Heat Influence from the Illumination

Even at optimum illumination setting for observation and photomicrography, the illuminating light will generate considerable radiant heat which may damage living specimens. In case of interference contrast observation special caution should be exercised. To prevent this damage, consider the following precautions:

- Reduce light intensity for observation as much as possible.
- Use additional heat absorbing filters for observation.
- For time-lapse photography, synchronize the on/off of the light bulb with the exposure (use SYNCHRONOUS mode).

9 Filters and Lamp Intensity Setting

Set the lamp intensity and filters in accordance with the film to be used.

<table>
<thead>
<tr>
<th>Film</th>
<th>Filter</th>
<th>Brightness intensity lever position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daylight type color film</td>
<td>45LBD-1F</td>
<td>Camera symbol position</td>
</tr>
<tr>
<td>Tungsten type color film</td>
<td>45LBT</td>
<td>Camera symbol position</td>
</tr>
<tr>
<td>B &amp; W film</td>
<td>43IF550-W45</td>
<td>Other position than camera symbol position</td>
</tr>
</tbody>
</table>

* To match your preference in color rendition, make test exposures for determining the lamp intensity.

© When IF550 is not used for color photography of phase contrast images, a neutral color is obtained by combining LBD filters and setting the lamp light intensity at around the lower limit of camera symbol.
3. Attaching the Video Adapter to the SLR Port (Figs. 112, 113)

**Microscope Frame (IX70)**

1. Using the Allen screwdriver, loosen the two clamping screws ① holding the intermediate body of the OM adapter on the SLR port. Remove the front section ② of the adapter. (Fig. 112)

2. The rear section of the adapter is provided with a thread ③ for mounting a T-mount. Firmly screw a C-mount adapter (U-CMT) ④ or an F-mount adapter (U-FMT) onto the thread.

© A commercially available T-ring (mfd. by Vixen) may also be used.

4. Attaching the Video Adapter to the Bottom Port

Modification is required to attach the video adapter to this port. For details, please consult your Olympus service center.

5. Attaching the Video Adapter to the Right Hand Side Port

Modification is required to attach the video adapter to this port. For details, please consult your Olympus service center.
# Turret Inserts and Compatible Objectives

<table>
<thead>
<tr>
<th>Condenser</th>
<th>Observation method</th>
<th>Turret insert</th>
<th>Turret insert replacement</th>
<th>Compatible objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>IX-LWUCD</td>
<td>Phase contrast (Note 1)</td>
<td>IX-PHL (S)</td>
<td>O</td>
<td>UPlanFl 4XPh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IX-PHC (S)</td>
<td>O</td>
<td>CPlan10XPh, LCAch20XPh, CPlanFl10XPh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IX-PH1 (S)</td>
<td>O</td>
<td>UPlanFl10XPh, UPlanFl20XPh, LCPlanFl20XPh, UPlanApo10XPh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IX-PH2 (S)</td>
<td>O</td>
<td>UPlanFl40XPh, LCPlanFl40XPh, LCPlanFl60XPh, UPlanApo20XPh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IX-PH3 (L)</td>
<td>O</td>
<td>LCAh40XPh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IX-DP10 (S)</td>
<td>O</td>
<td>UPlanFl10XUPlanApo10X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IX-DP20 (S)</td>
<td>O</td>
<td>LCPlanFl20X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IX-DP40 (L)</td>
<td>O</td>
<td>LCPlanFl40X, UPlanApo40X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IX-DP60 (L)</td>
<td>O</td>
<td>LCPlanFl60X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IX-DPO60 (L)</td>
<td>O</td>
<td>UPlanApo60XWPSF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IX-DP100 (L)</td>
<td>O</td>
<td>UPlanFl100Xo, UPlanApo100Xo</td>
</tr>
<tr>
<td>Brightfield</td>
<td></td>
<td></td>
<td></td>
<td>NA0.13 – 0.9 objectives (Note 2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condenser</th>
<th>Observation method</th>
<th>Turret insert</th>
<th>Turret insert replacement</th>
<th>Compatible objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>IX-ULWCD</td>
<td>Phase contrast</td>
<td>PHL (built-in)</td>
<td>X</td>
<td>UPlanFl4XPh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IX-PHC</td>
<td>O</td>
<td>CPlan10XPh, LCAch20XPh, CPlanFl10XPh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IX-PH1</td>
<td>O</td>
<td>UPlanFl10XPh, UPlanFl20XPh, LCPlanFl20XPh, UPlanApo.10XPh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PH2 (built-in)</td>
<td>X</td>
<td>UPlanFl40XPh, LCPlanFl40XPh, LCPlanFl60XPh, UPlanApo20XPh, LCAh40XPh</td>
</tr>
<tr>
<td>Brightfield</td>
<td></td>
<td></td>
<td></td>
<td>Magnification 2.5X or more and NA0.75 or lower objectives</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condenser</th>
<th>Observation method</th>
<th>Turret insert</th>
<th>Turret insert replacement</th>
<th>Compatible objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>IX-SLWCD</td>
<td>Phase contrast</td>
<td>PHL (built-in)</td>
<td>X</td>
<td>UPlanFl4XPh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PHC (built-in)</td>
<td>X</td>
<td>CPlan10XPh, LCAch20XPh, CPlanFl10XPh</td>
</tr>
<tr>
<td>Brightfield</td>
<td></td>
<td></td>
<td></td>
<td>Magnification 2.5X or more and NA0.3 or lower objectives</td>
</tr>
</tbody>
</table>

**Note 1:** Small diameter turret inserts should be placed in the 30 mm diameter turret opening, and large diameter turret inserts should be placed in the 38 mm diameter turret opening.

**Note 2:** When combined with an objective of NA 0.3 or higher, the resolution may decrease somewhat. For a well observation, the phase contrast effect can be obtained in a large area of the field of view when the PHC is used.
<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan semi apochromatic phase contrast</td>
<td>UPlanFl4XPh, UPlanFl10XPh, LCPlanFl20XPh, LCPlanFl40XPh, LCPlanFl60XPh</td>
</tr>
<tr>
<td></td>
<td>NA0.13, WD17 mm, ring slit PhL</td>
</tr>
<tr>
<td></td>
<td>NA0.3, WD10 mm, ring slit Ph1</td>
</tr>
<tr>
<td></td>
<td>NA0.4, WD6.9* mm, ring slit Ph1, correction cap system</td>
</tr>
<tr>
<td></td>
<td>NA0.6, WD2.6* mm, ring slit Ph2, correction cap system with correction collar</td>
</tr>
<tr>
<td></td>
<td>NA0.7, WD1.7* mm, ring slit Ph2, correction cap system with correction collar</td>
</tr>
<tr>
<td>Plan semi apochromatic DIC brightfield</td>
<td>UPlanFl10X, LCPlanFl20X, LCPlanFl40X, LCPlanFl60X</td>
</tr>
<tr>
<td></td>
<td>NA0.3, WD10 mm</td>
</tr>
<tr>
<td></td>
<td>NA0.4*, WD6.9* mm, correction cap system</td>
</tr>
<tr>
<td></td>
<td>NA0.6, WD2.6* mm, correction cap system with correction collar</td>
</tr>
<tr>
<td></td>
<td>NA0.7, WD1.7* mm, correction cap system with correction collar</td>
</tr>
<tr>
<td>Brightfield high resolution DIC</td>
<td>PlanApo60XO, UPlanFl100XO, UPlanApo100XOI</td>
</tr>
<tr>
<td></td>
<td>NA1.4, WD0.1 mm</td>
</tr>
<tr>
<td></td>
<td>NA1.3, WD0.1 mm</td>
</tr>
<tr>
<td></td>
<td>NA1.35, WD0.1 mm, with iris diaphragm</td>
</tr>
<tr>
<td></td>
<td>NA0.4, WD3.1 mm</td>
</tr>
<tr>
<td></td>
<td>NA0.75, WD0.55 mm, with water-proof cap</td>
</tr>
<tr>
<td></td>
<td>NA0.9, WD0.2 mm, with water-proof cap</td>
</tr>
<tr>
<td></td>
<td>NA1.35, WD0.1 mm, with iris diaphragm and water-proof cap</td>
</tr>
<tr>
<td>Water immersion objective</td>
<td>UPlanApo60Xw</td>
</tr>
<tr>
<td></td>
<td>NA1.2, WD0.25 mm, correction collar range: 0.15 - 0.19 mm</td>
</tr>
</tbody>
</table>

*When the correction cap for standard culture vessel is used.

<table>
<thead>
<tr>
<th>Main Frame Electric System</th>
<th>IX70-S8F / IS70-SIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brightness adjustment range:</td>
<td>DC 1.0 - 11.9 V (continuous), with light-off switch</td>
</tr>
<tr>
<td>Power requirements:</td>
<td>100-120V/220-240V 2.7A/1.5A 50/60 Hz</td>
</tr>
<tr>
<td>Rated output:</td>
<td>12V 100W</td>
</tr>
<tr>
<td>Bulb used:</td>
<td>12V 100W Halogen lamp Philips 7724</td>
</tr>
<tr>
<td>Average life time of bulb:</td>
<td>approx. 2,000 hr.</td>
</tr>
<tr>
<td>Applicable fuse:</td>
<td>15A (H) 250V (LITTEL FUSE 2150S5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IX50-S8F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brightness adjustment range:</td>
</tr>
<tr>
<td>Power requirements:</td>
</tr>
<tr>
<td>Rated output:</td>
</tr>
<tr>
<td>Bulb used:</td>
</tr>
<tr>
<td>Average life time of bulb:</td>
</tr>
<tr>
<td>Applicable fuse:</td>
</tr>
</tbody>
</table>

Operation environment:
- Indoor use
- Altitude up to 2000 m
- Temperature: 5°C to 40°C (41°F to 104°F)
- Maximum relative humidity 80% for temperatures up to 31°C (88°F) decreasing linearly to 50% relative humidity at 40°C (104°F)
- Main supply voltage fluctuations not to exceed ±10% of the nominal voltage
- Installation/Overvoltage Category II (In accordance with IEC664)
- Pollution Degree 2 (In accordance with IEC664)
<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Remedy</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. The image shows diffraction</td>
<td>Condenser is raised too high.</td>
<td>Lower down to the proper position.</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>The aperture iris diaphragm is stopped down too far.</td>
<td>Open the aperture iris diaphragm.</td>
<td>37</td>
</tr>
<tr>
<td>6. Visibility is poor.</td>
<td>You are using a non-UIS series objective.</td>
<td>Use only UIS series objectives with this microscope.</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>• Image is not sharp.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Contrast is poor.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Details are indistinct.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The correction collar on the correction collar equipped objective is not adjusted.</td>
<td>While focusing, turn the correction collar to find the best position.</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>Front lens of the objective is dirty.</td>
<td>Clean the objective.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Immersion oil is not being used with an oil immersion objective.</td>
<td>Use immersion oil.</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>The immersion oil contains bubbles.</td>
<td>Remove bubbles.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inappropriate slide or cover glass thickness.</td>
<td>Replace with glass of appropriate thickness.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dirty condenser, objective, eyepiece, culture vessel, etc.</td>
<td>Clean thoroughly.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ring attachment and phase plate are not centered.</td>
<td>Center correctly.</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>Poor contrast during differential interference contrast observation.</td>
<td>Replace plastic culture vessel with glass vessel.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Culture vessel bottom thickness and the respective objective correction cap type do not match.</td>
<td>Replace with suitable correction cap.</td>
<td>39</td>
</tr>
<tr>
<td>7. Part of the image is blurred.</td>
<td>The objective is not correctly engaged in the light path.</td>
<td>Make sure that the revolving nosepiece clicks into place correctly.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The specimen is not placed flat on the stage.</td>
<td>Place the specimen correctly on top of the stage and secure it with the specimen holder.</td>
<td>6, 7</td>
</tr>
<tr>
<td>8. The coarse and fine adjustment knobs are hard to turn.</td>
<td>The tension adjustment ring is tightened excessively.</td>
<td>Loosen the ring.</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>You are trying to raise the revolving nosepiece with the coarse adjustment knob even though the prefocusing lever is locked.</td>
<td>Unlock the prefocusing lever.</td>
<td>24</td>
</tr>
<tr>
<td>9. The revolving nosepiece drifts down by itself, or focus is lost during observation.</td>
<td>The tension adjustment ring is too loose.</td>
<td>Tighten the ring.</td>
<td>24</td>
</tr>
<tr>
<td>10. Coarse adjustment will not go all the way up.</td>
<td>Prefocusing lever is keeping the revolving nosepiece down.</td>
<td>Unlock the lever.</td>
<td>24</td>
</tr>
<tr>
<td>11. Field of view of one eye does not match that of the other.</td>
<td>The interpupillary distance is incorrect.</td>
<td>Adjust the interpupillary distance.</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Incorrect dioptr adjustment.</td>
<td>Adjust the dioptr setting.</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>The optical axes are not parallel.</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Approval Organization</td>
<td>Printed or embossed Harmonization Marking (May be located on jacket or insulation of internal wiring)</td>
<td>Alternative Marking Utilizing Black-Red-Yellow Thread (Length of color section in mm)</td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Comité Electrotechnique Belge (CEBEC)</td>
<td>CEVEC &lt;HAR&gt;,</td>
<td>Black</td>
<td>Red</td>
</tr>
<tr>
<td>Verband Deutscher Elektrotechniker (VDE) e.V. Prüfstelle</td>
<td>&lt;VDE&gt; &lt;HAR&gt;,</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>Union Technique de d'Electricité* (UTE)</td>
<td>USE &lt;HAR&gt;,</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Instituto Italiano del Marchio di Qualità* (IMQ)</td>
<td>IEMMEQU &lt;HAR&gt;,</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>British Approvals Service for Electric Cables (BASEC)</td>
<td>BASEC &lt;HAR&gt;,</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>N.V. KEMA</td>
<td>KEMA-KEUR &lt;HAR&gt;,</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>SEMKO AB Svenska Elektriska Materielkontrollanstalter</td>
<td>SEMKO &lt;HAR&gt;,</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Österreichischer Verband für Elektrotechnik (ÖVK)</td>
<td>&lt;ÖVE&gt; &lt;HAR&gt;,</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>Danmarks Elektriske Materielkontrol (DEMKO)</td>
<td>&lt;DEMKO&gt; &lt;HAR&gt;,</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>National Standards Authority of Ireland (NSAI)</td>
<td>&lt;NSAI&gt; &lt;HAR&gt;,</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Norges Elektriske Materielkontroll (NEMKO)</td>
<td>NEMKO &lt;HAR&gt;,</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Asociacion Electrotecnica Y Electronica Espanola (AEE)</td>
<td>&lt;UNDE&gt; &lt;HAR&gt;,</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>Hellenic Organization for Standardization (ELOT)</td>
<td>ELOT &lt;HAR&gt;,</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Instituto Portugues da Qualidade (IPQ)</td>
<td>IPQ &lt;HAR&gt;,</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Schweizerischer Elektro Technischer Verein (SEV)</td>
<td>SEV &lt;HAR&gt;,</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>Elektriska Inspektorate</td>
<td>SETI &lt;HAR&gt;,</td>
<td>10</td>
<td>30</td>
</tr>
</tbody>
</table>

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