COMPONENTS

1. **Interpupillary Scale**
   Adjustable from 48mm through 75mm

2. **Eyepieces**
   WF10x supplied as standard. WF15x & WF20x are available options.

3. **Left eyepiece tubes with dioptic adjustment ring**
   Adjustable for differences in eyesight.

4. **Right eyepiece tube**

5. **Right and Left Housings**

6. **RMOVING NOSpiece**
   Inward-faced (reversed) quadruple revolver accepting objectives

7. **Objectives**
   4x, 10x, 40x and 100x provided, and 40x and 100x retractable and sealed

- 1 -
DESCRIPTIONS

8. **Substage Condenser**
   With iris diaphragm and swing-out filter holder

9. **Swing-out Filter holder**
   For white diffusion filter provided

10. **Locking screw for substage condenser**

11. **Lever for iris diaphragm**

12. **Focusing knob for substage condenser**

13. **Illuminator Condenser**

14. **Viewing head**
   Siedentopf type with 30°inclined eyepiece tubes. Trinocular type also available.

15. **Locking thumb screw for head**
   Make sure to tighten it before use.

16. **Stand arm**

17. **Double layers Mechanical Stage**
   Travelling through 70mm x 30mm.

18. **Tension control ring**
   For coarse focusing adjustment

19. **Coarse focusing adjustment knob**

20. **Fine focusing adjustment knob**

21. **Mechanical stage control knob**
   Coaxial drive control on right hand.

22. **On-Off switch for illuminator**
   “I”=On, ”0”=Off

23. **Base**
   With built-in 3 watts white LED illumination powered by AC/DC adapter.

24. **Light intensity control dial**
SETTING UP YOUR MICROSCOPE

After opening the styroform container, check that you have the following parts and accessories.

- Microscope stand complete
- Binocular or Trinocular Viewing head
- WF10x Eyepiece(s) (pair for Binocular or Trinocular head)
- Objectives in plastic container
- White diffusion filter
- AC/DC adapter 100-240VAC 50/60Hz
- C-Wrench for tension control
- Immersion oil in container
- Dust cover
- Instruction manual
- For trinocular viewing head, C-mount tube and Photo tube

1. Place the stand on a level, stable surface. The microscope is easiest to use when you face the front of the stage.
2. Loosen the head locking thumb screw provided on the side of the arm, and put the viewing head onto the receptacle. The head can turn full 360° inside the receptacle. This permits observation from any direction. Tighten the thumb screw to fix the head in any position you desire.
3. Put the eyepiece(s) into the eyepiece tube(s), being careful not to touch the lenses.
4. Take out the objectives from the plastic containers and screw them into the revolving nosepiece from the lowest magnification to the higher one in clockwise direction as you face the upside of the microscope.
5. Turn the switch off (O) and connect the AC/DC adapter to electric power supply.
USING AND ADJUSTING YOUR MICROSCOPE

**Viewing Head:**
The viewing head is inclined 30 degrees to enable comfortable observation and rotates 360 degrees to permit observation from any direction. To rotate it, loosen the head locking thumb screw and tighten it when the head is located at the position you desire. Do not use the microscope without tightening the thumb screw. The optical alignment is adjusted to be used with the thumb screw tightened.

The binocular and trinocular head, require interpupillary adjustment. To adjust the eyepieces to the interpupillary distance between your eyes, please grasp the right & left housings below the eyepiece tubes and move them farther apart or closer together in order to match your pupil distance. The correct adjustment is achieved when your view becomes comfortable and presents a full single field. Read the interpupillary scale and remember the distance of your pupil for your future use.

The dioptric adjustment ring is located on the left eyepiece tube. To correct a dioptric difference between your eyes, begin by looking through the right eyepiece with your right eye, use the fine focusing handle to get the sharpest image of the specimen. Then, look through the left eyepiece with your left eye and turn the dioptric adjustment ring until you get an image in the same sharpness as the right one. Make the left eye adjustment without moving the focusing handle.

The CN series has Siedentopf type binocular or trinocular head is designed to leave the mechanical tube length of 160mm unchanged when the interpupillary distance is adjusted. This will not affect the diopter adjustment.

**Arm:**
The arm is fixed securely to the base and supports all the components above the base. When moving the microscope, please grasp the arm and support the base with the other hand. Do not carry or hold the microscope any other way.

**Base:**
Do not open the base. It contains various electrical components.

**Illuminator:**
Illumination is provided by a 3W LED light powered by AC/DC adapter and condenser lens. Turn the switch on (I) and rotate the light intensity control dial to adjust the brightness.
Objectives:
DIN achromatic objectives are corrected for chromatic(colour) aberration. Your microscopes may be equipped with Semi-plan or Plan achromatic objectives which minimize the effects of curvature of field and produce flatter images. The 4 objectives will be parfocal when properly fix to the nosepiece so it should not be necessary to make large adjustments in focus when changing objectives.

Objectives 4x and 10x have relatively long working distances while the objectives 40x and 100x have a very short working distance. The 40x and 100x objectives are retractable (spring-loaded in the lens mount) to protect the specimen slide.

Oil immersion objective 100x is made to get the correct magnification with the intermediate of immersion oil between the specimen slide and the objective. When using 100x objective, begin focusing using the lower magnification objective. Put a drop of oil on the illuminated area of the specimen and rotate the nosepiece to bring the 100x objective into the optical path. Looking through the eyepiece, turn the fine focusing handle to bring the specimen into focus. When bringing the objective into position, pay attention to not introduce air bubbles into the oil as the bubble will interfere with your observation. If an air bubble is introduced into the oil it can easily be removed by turning the objective to the right and left slightly still touching the oil on the slide. The air bubble will disappear. After using the 100x objective, be sure to wipe off the oil thoroughly from the objective and the slide using a soft clean cloth or lens tissue moistened with Xylol.

The objectives 40xR and 100xR are sealed to prevent damage from contact with immersion oil, although the oil is not required for use with objective 40xR.

The high power objective requires bright light rays matching the Numerical Aperture of the objective. The NA of the 100x objective is 1.25 and a condenser with NA1.25 should be used with it. Numerical Aperture(NA) refers to resolving power limits, and is expressed with formula NA = N x Sin U, N is refractive index of medium (air or oil) between objective and slide, and U is half of the aperture angle. Larger NA number relates to larger resolving power.

Eyepiece:
One pair of Wide Field eyepieces WF10x are supplied, having Field Number of 20 or 18. The FN20 eyepiece offers extra wide field of view and the high eye point of 18.8mm. The FN18 eyepiece has the eye point of 18.5mm, and a 19mm diameter micrometer disc can be installed in it as option. The actual field of view of the magnification is calculated as follows.
Field Number of eyepiece
Magnification of objective

So, the larger Field Number of eyepiece makes wider field of view for the objective. WF15x with retainer for micrometer disc and WF20x without retainer are available as option.

Mechanical Stage:
The long coaxial drive control mechanical stage is provided and makes the operation much easier. It runs through 70mmx30mm.

The mechanical stage has vernier scales for measurement of movement in the X-Y axis. The minimum reading is 0.1mm. By using the vernier you can record the position of the object on the slide by noting the readings on the scale. Repositioning the slide to those readings makes locating the object very easy for future observations.

Focusing Device:
Coaxial coarse and fine focusing adjustment knobs are provided. Turning the coarse focusing knobs raise the stage until it is stopped by the up stop. Then, looking through the eyepiece, lower the stage by turning the coarse focusing knobs until you find the object focused. To get sharper images, use the fine focusing knob. All the objectives are made PAR-FOCAL. Once focusing is made with one objective, no re-adjustment of focus by the coarse focusing knobs will be necessary when changing to any other objective. To make the image sharpest, it may be necessary to make a slight adjustment using the fine focusing knob.

The fine focus knob is graduated at both sides and each division corresponds to 0.004mm drive and one rotation of the fine focusing knob corresponds to 1.6mm drive.

The tension control ring is located on the right side of the coarse focus knob. The tightness of the coarse focusing movement can be adjusted by turning this ring using the C-Wrench. For instance, when you change the sub stage condenser assembly to the phase turret condenser, if you feel the need to adjust the tension of the coarse focusing movement, please use this device.
Substage Condenser:
Abbe type substage condenser (NA 1.25) focusable with rack and pinion mechanism is provided. The top lens of the condenser is sealed to prevent damage from contact with oil. The condenser is replaceable with phase turret condenser. The functions of the condenser are to bring the light rays to a focus in the plane of the specimen and to furnish a suitable cone of light to the objective. The diameter of the cone of light is controlled by the iris diaphragm which provides a variable opening to fill the back lens of the objective thereby utilizing the full resolving power of the objective.

When the objective 100xR is used, by using the condenser focusing knob, always move the condenser to its highest position. The numerical aperture 1.25 of the condenser corresponds with the numerical aperture of the objective 100x. To induce the full numerical aperture 1.25, it is designed to be immersed with oil between the top lens of condenser and the slide, without air spacing correctly.

Care must be taken to wipe off the oil thoroughly from the condenser lens and the slide immediately after each use. When the oil immersion objective is used, the condenser should always be raised to the highest position.

Iris Diaphragm:
The diaphragm is an important factor in obtaining good images. It is not intended to control the brightness of the illumination. A large aperture transmits too much light and creates an image with poor contrast. Smaller apertures increase contrast. To set the proper aperture, make the aperture of the diaphragm largest and reduce until the fine details of the specimen are imaged sharply.

Reducing the aperture increases contrast and depth of focus but it also reduces resolution and introduces diffraction. The aperture must be selected for each objective: i.e. the aperture for the 10x objective (NA 0.25) will not be the same as for the 40x (NA 0.65), since the angle of light required is determined by the numerical aperture of the objective. Proper adjustment of the diaphragm aperture is easily determined. After placing an objective into the optical path and focusing, remove the eyepiece and look through the optical tube. Observe the diaphragm through the objective, then move the iris lever to coincide with the edge of the objective aperture.
Swing-out Filter Holder:
A filter holder is located under the iris diaphragm and a white diffusion filter is supplied. Swing out the filter holder, insert the filter and swing it back to position.

The white diffusion filter diffuses and weakens the light. Other filters of 32mm dia. can be used for different purposes if necessary.

MAINTENANCE OF MICROSCOPE

Model CN series microscope is designed such that only a minimum maintenance work is necessary. Nevertheless proper care will extend the life of the instrument considerably. There are five important rules you should observe.

1. Keep it away from dust. Always cover the microscope with the vinyl dust cover provided, or put it back to the styrofoam container, whenever you are not using the instrument. If dust gets on the lenses, blow it off with a rubber syringe or use a camel's hair brush. Optical lenses are very soft, and can easily get scratched by dust particles.

2. Do not touch the lens. Do not touch the lenses, finger print are difficult to remove. Use a soft linen moistened with xylol to remove fingerprints.

3. Keep it away from moisture. Moisture is optical lenses worst enemy. Once you get fungus on the lenses, they cannot be returned to their original condition. Keep the instrument in a dry place.

4. Do not drop the microscope. Needless to mention, optical parts are very delicately made and are easily broken. Also the mechanical parts are made with the highest precision and will be damaged if dropped.

5. Do not dismantle. Fitting of all parts have been done with great care by skilled experts, and once you dismantle, the smoothness of mechanical part or clearness of optics will be spoiled. Return the instrument to an authorized dealer or to the factory if need for dismantling arises.
PHASE CONTRAST SYSTEM

Phase contrast is a form of illumination which alters the normal path of light waves from an object to a wavelength shifted diffraction pattern thus allowing visualization of transparent or low contrast specimens. This allows living cells and suspensions to be viewed without the need for staining procedures.

- Phase Set Components
- Phase Turret Condenser, N.A 1.25
- Achromat or Plan Phase Objectives (DM)
  - 10X NA=0.25
  - 20X NA=0.40
  - 40X NA=0.65
  - 100X (oil) NA=1.25
- Centering Telescope
- Green Filter
- Installation Key (Screwdriver)
- Storage Case

INSTALLATION AND ALIGNMENT

1. Replace the normal brightfield objectives of the microscope with the phase objectives (Dark & Medium type) supplied in the storage case.
2. Remove the brightfield substage condenser by loosening the condenser locking thumb screw and gently lowering the condenser down and out of the mounting ring. This thumb screw is located on the left side of the condenser mount as you face the front of the microscope.
3. Install the Phase Turret Condenser by sliding it up into the condenser mount and tightening the condenser locking thumb screw using the Installation Key provided. The index mark (white dot) on the turret condenser should be situated at the front of the microscope.
4. Rotate the turret dial of the condenser to align the zero (0) mark to the index mark on the turret housing. This is the setting to use for any brightfield work.
5. Raise the condenser to its maximum height and place a specimen slide on the stage.
6. Swing the 10X objective into the optical path and focus.
7. Move the slide, using the mechanical stage, to a location with little or nothing in the field of view.
8. Rotate the turret dial of the condenser to align the 10 mark to the index mark (white dot) on the turret housing.
9. Replace either eyepiece with the Centering Telescope. Looking through the telescope, you can see two rings of light, one at the center of view, the other slightly off center.
10. Using the focusing control of the Centering Telescope only, focus the rings to maximum clearness.

11. To achieve optimum performance, the bright ring must be positioned concentric with the darker ring at the center of view. This is done by using the knurled ring holding the illumination annulus located underneath the turret housing. Move the knurled ring until the bright ring is concentric with the dark ring. (See the right chart)

12. Put the green filter onto the top of the illuminator condenser frame.

13. Replace Centering Telescope with normal eyepiece. You can observe an excellent phase contrast view of your specimen.

14. STEP 9-12 should be performed for the other objective lenses.

Note)
1: The phase turret dial number must match the magnification power of each objective. 10=10X, 20=20X, 40=40X, 100=100X
2: Use slides which are free of dust and 1mm thick with cover slips 0.17mm thick.
3: Care should be taken not to disturb the illumination annulus under the turret of the phase condenser after it has been adjusted (STEP 11), otherwise misalignment may occur.
**TV MICROSCOPY**

**Direct Focus**
Trinocular model provides the C-Mount tube as a standard accessory. Through the C-mount tube, the image produced by objective can be sent directly to CCTV camera. Compared with the secondary image produced with the TVA-45 camera adapter, the direct image becomes sharper and clearer, while the field of view becomes narrower.

How to mount CCTV camera onto microscope
1. Make sure that your CCTV camera has C-mount.
2. Separate the C-mount tube into two pieces by loosening the locking thumb screw, black short tube and long white tube.
3. Attach the camera to the short tube.
4. Screw the long tube into the viewing head.
5. Attach the short tube with the camera to the long tube and tighten the locking thumb screw.
6. Connect the camera to monitor by following the instructions provided with the camera and the monitor.

If necessary, you can change the direction of the image on the monitor by turning the black short tube with the camera after loosening the locking thumb screw. Make sure to tighten the said locking thumb screws after adjustment.
Indirect Focus
Model TVA-45 adapter is optionally available, allowing a CCTV camera to be connected with photo tube of microscope. The TVA-45 adapter has a built-in reducing lens to make the field of view wider and also make the magnification smaller than the direct focused image.

How to mount CCTV camera with the TVA-45 adapter
1. Screw the photo tube into the viewing head.
2. Attach the camera to the adapter.
3. Attach the adapter with the camera to the photo tube.
4. Connect the camera to monitor by following the instructions provided with the camera and the monitor.
PHOTOMICROGRAPHY WITH DIGITAL STILL CAMERA

You can take photomicrographs with your SLR digital camera using optional accessories Model DG adapter and various kinds of T-mount adapter available according to your camera.

How to mount SRL digital camera onto microscope
1. Remove the mounted lens from your camera.
2. Attach a T-mount adapter to the DG adapter.
3. Mount your camera body to the T-mount adapter with the adapter.
4. Put the DG adapter with the camera body into the photo tube.
5. Turn the camera to the position you desire and tighten the locking screw of the DG adapter.
6. Put the specimen into focus looking through eyepieces, and then, focus it sharper looking through the camera finder if necessary.
## OPTIONAL PARTS AND ACCESSORIES

### Heads:
- CNA471  Trinocular head, Siedentopf type, w/photo tube and C mount tube, without eyepiece
- CNA472  Binocular head, Siedentopf type, without eyepiece
- CNA473  Monocular head, without eyepiece

### Eyepieces:
- M9261-100  DIN Wide Field 10x FN18, with retainer for reticle
- M9261-101  DIN Extra Wide Field 10x FN20
- M9261-150  DIN Wide Field 10x, with retainer for reticle
- M9261-200  DIN Wide Field 20x

### Objective set:
- CDA520  DIN Semi-plan achromat 4x, 10x, 40xR(sealed), 100xR oil
- CDA530  DIN Plan achromat 4x, 10x, 40xR(sealed), 100xR oil

### Miscellaneous:
- M9260-1  Phase contrast accessory with phase achromat 10x, 20x, 100xR oil & phase plan 40xR, phase turret condenser, centering telescope, green filter, driver in aluminum case
- CDA550  Phase contrast accessory with phase plan 10x, 20x, 40xR, 100xR oil, phase turret condenser, centering telescope, green filter, driver in aluminum case
- CDA551  Dark field condenser with Plan objective 100x with iris diaphragm
- M9260-2  Simple polarizing set
- DG  Adapter for digital SRL camera
- T-mount adapters according to digital SRL cameras
## STANDARD SPECIFICATIONS

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<td>Siedentopf binocular</td>
<td>WF10x(pair)</td>
<td>DIN Achromat 4x, 10x, 40xR, 100xR Oil</td>
<td>Sealed NA1.25 Abbe, Rack &amp; Pinion</td>
<td>Mechanical stage</td>
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<tr>
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<tr>
<td>CN-P</td>
<td>Siedentopf binocular</td>
<td>WF10X(pair)</td>
<td>DIN Plan Achromat 4x, 10x, 40xR(sealed), 100xR Oil</td>
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<tr>
<td>CN-PH</td>
<td>Siedentopf binocular</td>
<td>WF10X(pair)</td>
<td>DIN Plan Phase 10x, 20x, 40xR(sealed), 100xR Oil</td>
<td>Sealed NA1.25 Abbe, Rack &amp; Pinion w/Phase turret</td>
<td>Mechanical stage</td>
<td>3W LED with Dimmer</td>
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