ZEISS

Standard microscope with in-base halogen illuminator 6V 10W for transmitted light

Operating Instructions

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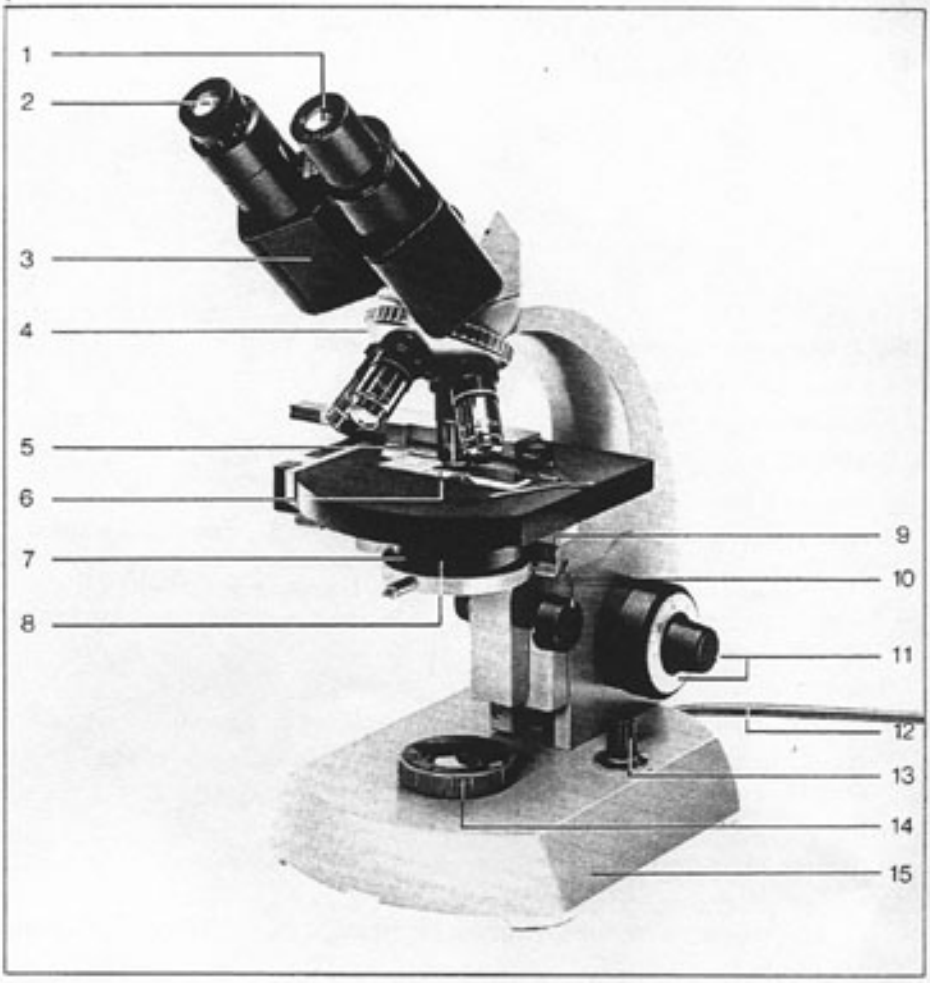

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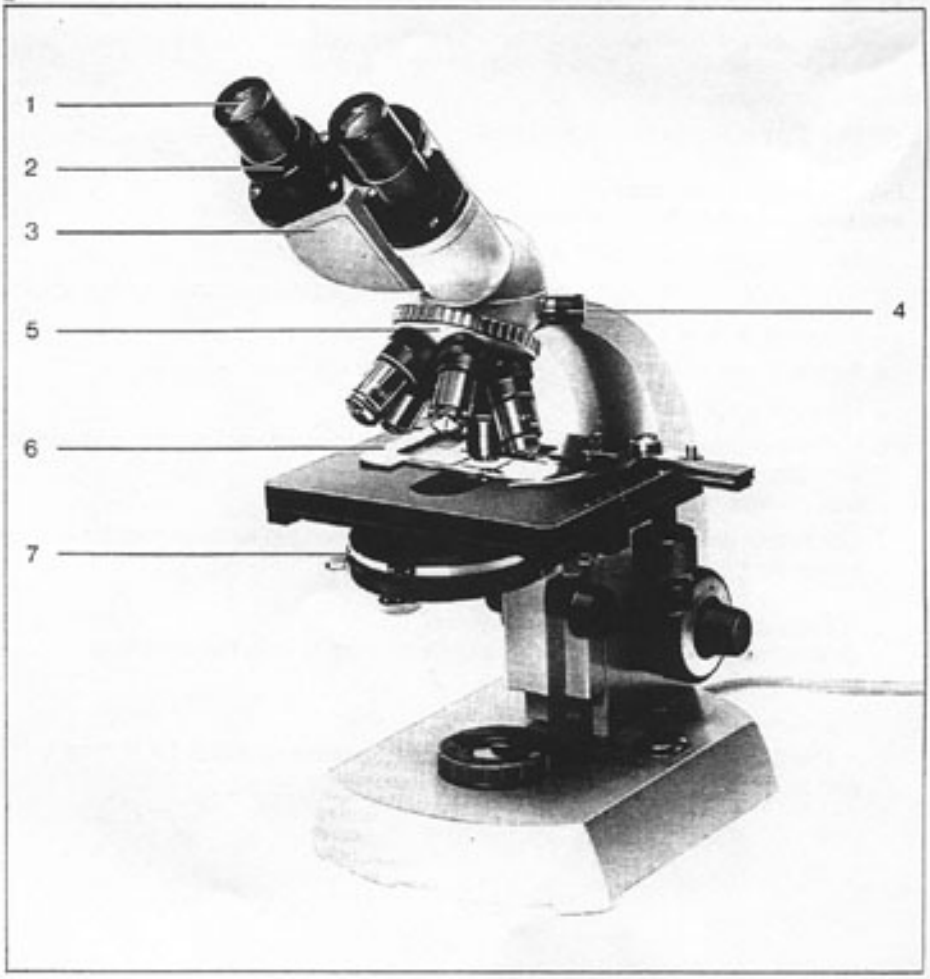

Fig. 1: Standard microscope 14 for transmitted light

1 Cpl wide angle eyepiece 10x/18 Br.[1] *(464022)*

2 Cpl wide angle eyepiece 10x/18 Br.[1] foc.[2] *(464023[3])* (with adjustable eyelens)

3 45° inclined binocular tube S *(473014)* and tube factor 1.25

4 Revolving nosepiece with 4 objectives

5 Mechanical stage *(413422–9901)* with coaxial control knobs to move the specimen in x and y directions over an area 25x75 mm.
The graduation determines the position of any point on a specimen to within 1/10 mm. Once the coordinates are known a particular detail can always be relocated.

6 Specimen

7 Lever to vary the aperture of the condenser aperture diaphragm

8 Condenser 0.9 Z with auxiliary swing-in lens and fixed auxiliary lens EL *(465134)*

9 Condenser centering screws

10 Condenser height adjustment knob

11 Coarse and fine focusing adjustment.
For one interval on the fine control vernier the stage moves 5 µm = 0.005 mm

12 Mains cable

13 Switch with brightness control for halogen lamp 6V 10W

14 Adjustment ring for field diaphragm. The dust cover glass can be removed from the ring. There is a separate holder for the filter dia. 32 mm within the plastic ring.

15 Stand base with in-base transformer

**Fig. 2: Standard microscope 16
equipped for brightfield, darkfield and phase contrast**

1 Kpl wide angle eyepiece 10x/18 Br.[2] *(464042-9903)*

2 Tube, adjustable, see instructions under "Focusing the specimen", page 7)

3 Binocular tube *(473011)* inclined at 45°

4 Switch to turn axis, e.g. with wide field changer 0.8x – 1x *(473068)*

5 Nosepiece with 5 objectives

6 Mechanical stage moving over an area 50x75 mm with graduation and vernier with controls on the right *(473415)*
with controls on the left *(473416)*

7 Condenser II/Z *(465270–9906)* with auxiliary swing-in lens for brightfield, phase contrast and darkfield

[1] Eyepiece for spectacle wearers.
Others may find it easier to find the correct distance from the eyepieces by using rubber eye cups.

[2] Eyepiece with focusing eyelens.

[3] The 6 or 10 figure numbers which appear in brackets are order numbers and are also found on the components themselves.

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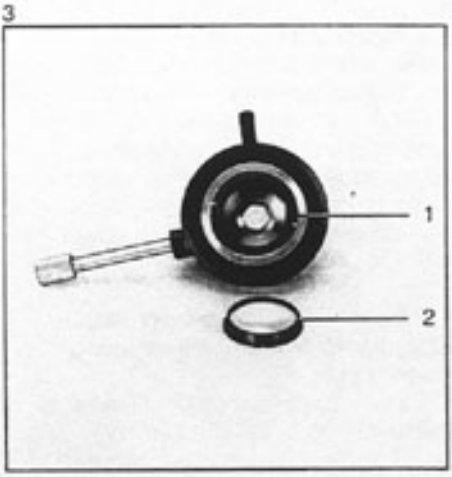

1.1 Inserting the condenser

Auxiliary lens EL *(46 51 34)* or auxiliary lens EL POL *(46 51 44)* (**3**.2 indicates Fig. **3**, part 2) can be screwed into the condenser (**3**.1) from underneath.
For darkfield condensers the condenser holder *(46 55 42)* has a threaded opening.
Bring the microscope stage to its uppermost position using the coarse control (**1**.11) and bring the condenser holder into its lowest position using knob (**1**.10).
Press the dovetail of the condenser against the spring bolts (**4**.1) until it engages.
Condensers with orientation groove should engage in the spring bolts.
The condenser should then be set at its upper stop.

4

1.2 Screwing in the objectives

Screw the objectives into the nosepiece in order of their power, e.g. 3.2 – 10 – 25 – 40 etc. It is easiest to insert objectives if the empty socket is turned towards the front.

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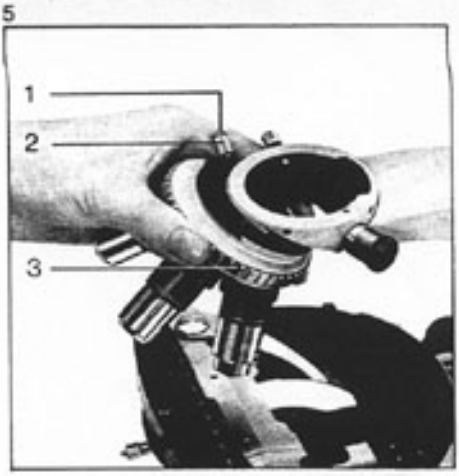

1.3 Inserting slide-in nosepiece on the limb top

Incline nosepiece (**5**.3) slightly, so that 2/3 of the rail carrying the clamping screw engages (**5**.2). Then raise the other guide rail so that this too engages.
Slide the nosepiece in as far as it will go (pull out the lock (**5**.1) on the bolt).
Tighten the clamping screws.

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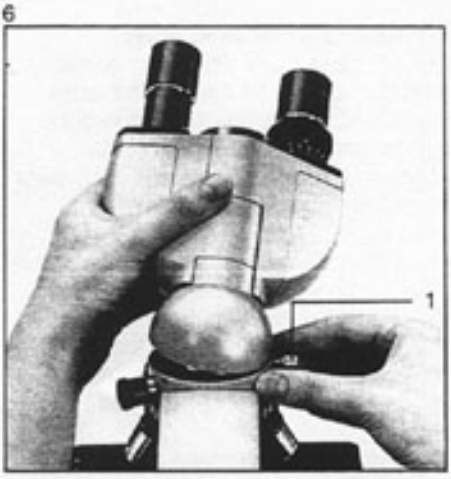

1.4 Attaching the tube
Loosen clamping screw (**6**.1). Hold tube at a slight angle and press annular dovetail against the spring bolts of the tube holder and turn it to the desired observation position. Tighten clamping screw before letting go of the tube.
Insert two eyepieces of equal power into the tubes.

1.5 Connecting the in-base illuminator 6 V 10 W to the mains using power cable
The stand base contains built-in transformer *(39 25 74–9103)* 220/9 V; 50…60 Hz maximum power input 18 VA
Protection class III, complies with VDE regulations
Built-in transformer *(39 25 74–9004)* 120/9 V 50…60 Hz UL tested with american plug.
For instructions on inserting the halogen lamp see page 16.

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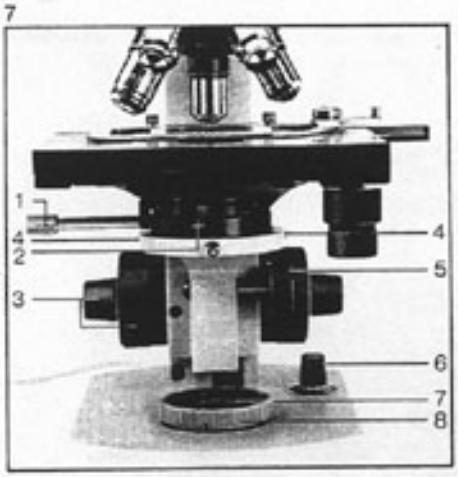

2.1 Microscope adjustment

- Switch on integral illuminator with transformer and adjust brightness. Place neutral filter on the filter mount (**7**.7).
- Raise condenser to its uppermost position by turning knob (**7**.5) Swing in condenser front lens (**7**.1). On a phase contrast condenser the condenser turret must be set in Ⓙ (iris) position.
- Place specimen on specimen stage and secure with specimen holder.
- Switch in a 10x or 16x objective.
- Insert two eyepieces of the same magnification in the binocular tube. Adjust the distance between the two tubes so that both eyes see a round, sharply defined field of view.

Focusing the specimen

- First look into the right eyepiece and using the knob (**7**.3) focus the specimen. Then adjust the focusing for the left eye:
a) by turning the adjustable tube inwards (**2**.2) on the binocular tube *(473011)*
b) or by adjusting the eyelens of the eyepiece (**1**.2) on the binocular tube *(473014)* for example.

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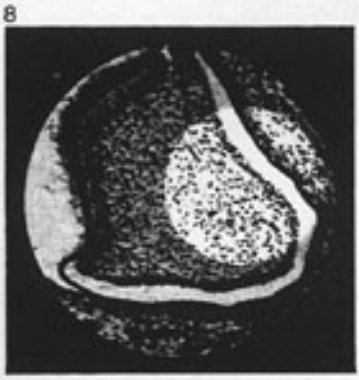

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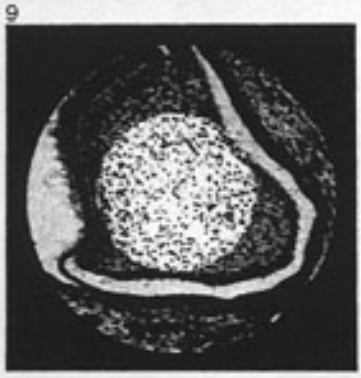

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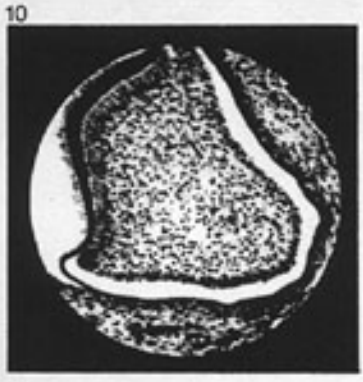

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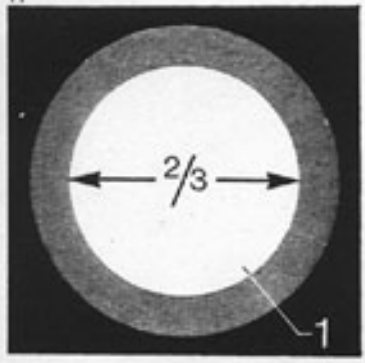

2.2 Adjusting the Köhler illumination

Correct adjustment of the field diaphragm gives:
an evenly illuminated specimen field, thus a brilliant image without reflections or glare; in addition the specimen is spared any unnecessary heat and is therefore better protected.

- Open field diaphragm about half way (**7**.8) and observe through the tube. Lower condenser using knob (**7**.5) until the diaphragm appears sharp in the specimen image field (Fig. **8**).

- Center the field diaphragm using screws (**7**.4) (Fig **9**) and then open it almost to the edge of the field of view, adjust again and open it wider until its edge disappears from the field of view. (Fig **10**).

Adjusting the condenser diaphragm

- To be able to see the condenser diaphragm one must remove the eyepiece from the tube and then observe it (**7**.2) in the objective aperture at its actual size or magnified by using a centering telescope *(46 48 22)* which has been inserted in the tube (**13**.1).

- On special condensers (Ph) set the condenser disk to Ⓙ (iris) and if necessary center the condenser diaphragm (**12**.2) using the knurled knob (**12**.4) and lever (**12**.3).

- Close the condenser diaphragm until its edge can just be seen in the objective aperture. The aperture of the condenser and objective are then approximately equal. This position gives the optimum optical image.

In the majority of cases the contrast is improved by opening the condenser diaphragm to approximately 2/3 of the diameter of the objective aperture (**11**.1). If the condenser diaphragm is closed down too much the image contrast and depth will be improved at the cost of image resolution, causing diffraction phenomena in the specimen, which can give the impression that structures are present in the specimen which are in fact only due to these phenomena.

- After checking the condenser diaphragm replace the eyepiece in the tube.

- After changing the objective check the adjustment of the field and condenser diaphragms and correct if necessary.

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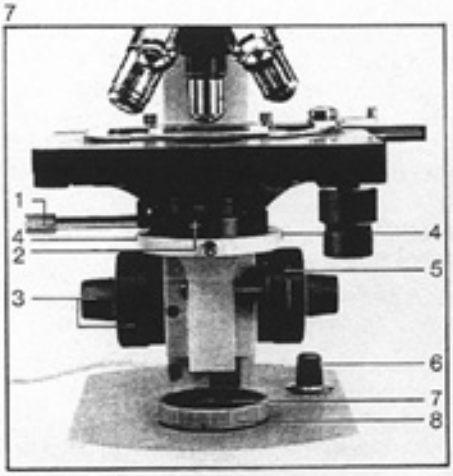

2.3 Working with low power objectives
Low power objectives (2.5x and less) image a large field. In order to illuminate this fully:

● Swing out the condenser auxiliary lens (**7**.1) or with a special condenser this should be unscrewed.
Lowering the condenser slightly with knob (**7**.5) can also improve illumination.
In this case the field diaphragm (**7**.8) functions as a condenser (aperture) diaphragm and should be opened.
Planachromat 1.0/0.04 *(46 20 10)* has a built-in field lens and is used without a condenser. It is not parfocalized with the usual objectives.

2.4 Working with immersion objectives and condenser immersion
An oil immersion objective is distinguished by the inscription "Oil" and by a black ring. It can be inserted into the nosepiece alongside dry objectives. We supply an oiler with every oil immersion objective which facilitates the application of the oil without air bubbles. Oil immersion objectives are mainly joined to the cover glass with oil.

● Swing the objective out of the light path. Turn the oiler upside down and let the air rise to the top, then apply a drop of the oil to the cover glass.

● Press the objective front lens upwards in its spring mount; plane objectives "Oil" should be locked by clockwise rotation. Switch the immersion objective into the light path and lower the objective front lens into the oil. Adjust image sharpness with fine focusing knob.

For most examinations using brightfield with immersion objectives it is sufficient to use the usual condenser with aperture 0.9 (dry).
Microscope immersion becomes necessary when the maximum resolving power of the microscope is to be fully utilized. In this case a condenser with an aperture of 1.3 or 1.4 is used with immersion oil.

● For this purpose a drop of immersion oil is applied with the oiler to the front lens of the condenser, so that the condenser and the bottom coverglass are joined with oil. After observations have been completed remove all oil carefully from all surfaces using cotton-wool tipped sticks and optical cleansing solution from our optics cleaning set (See G 41-102).

2.5 The total magnification of the microscope is calculated thus:

$V_{microscope} = M_{objective} \times V_{eyepiece}$ x factor as appropriate

e.g. 500 = 40 x 10 x 1.25

Key:

$M_{objective}$ = initial magnification of the objective, 40 in the example

$V_{eyepiece}$ = magnification of the eyepiece, 10 in the example

factor of a magnification system or in the example tube factor 1.25 of the binocular tube S *(47 30 14)*.

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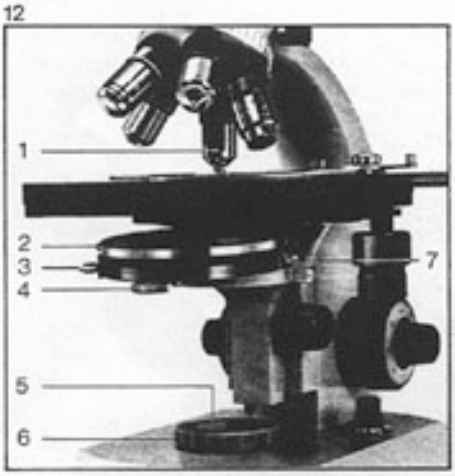

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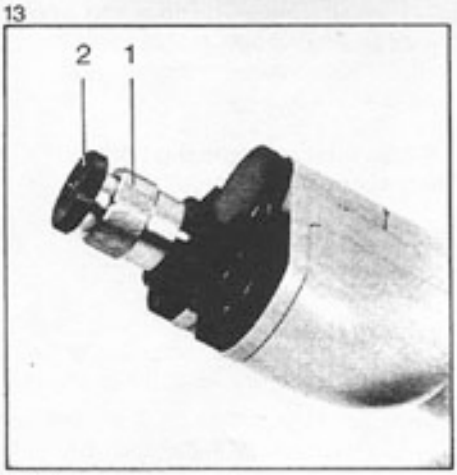

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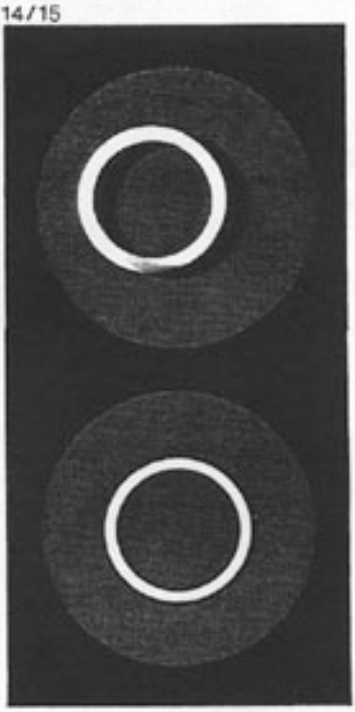

The Ph equipment makes structures in unstained specimens and living organisms clearly visible. It reveals the whole information content of microscopic images without artifacts due to staining and fixation.

Attaching the phase contrast equipment to the microscope

- Mount the Ph objectives (**12**.1) onto the nosepiece
- Insert the Ph condenser (**12**.2) with assembled auxiliary lens EL into the condenser holder, so that the spring bolts lock in the annular dovetail groove.

Adjustment for phase contrast

- Switch in Planachromat 16/0.35 Ph 2 or an objective with a similar initial magnification
- Focus the specimen first of all in brightfield with the Ph condenser in position Ⓙ (iris) (See page 8).
- Switch in the annular diaphragm Ph (**12**.7) which corresponds to the Ph objective by turning the condenser turret e.g. for Planachromat 16/0.35 Ph in position ②.
- Insert centering telescope (**13**.1) instead of an eyepiece in the binocular tube and focus its eyelens (**13**.2) until both a bright and a dark ring can be seen (Fig **14**). If a centering telescope is not available, an eyepiece should be removed and the rings observed in the empty tube.
- Using the lockable lever (**12**.3) and knob (**12**.4) of the Ph condenser the bright ring should be brought to lie exactly within the dark ring (Fig **15**).
- Remove the centering telescope from the tube and replace the eyepiece. *Again observe the Ph image in the binocular tube.*

Every time an objective is changed the field diaphragm (**12**.6) must be readjusted to the size of the field of view and the appropriate annular diaphragm on the condenser turret be switched in. When the specimen is changed the centering of the Ph annular diaphragm should be checked.

- Place green filter VG 9 on filter holder (**12**.5).

Microscope equipment for darkfield corresponds to that used for brightfield, except for the condenser. The object is illuminated by the darkfield condenser with a hollow beam cone, whose inner aperture must be larger than the objective aperture. Only the light deflected by the specimen enters into the objective, thus the background of the image remains dark.

- Insert darkfield condenser on condenser holder Z *(46 55 42)* with screwed in auxiliary lens EL into the condenser carrier.

Dry darkfield condensers

Condenser 0.8/0.9 *(46 55 05)* for objectives with aperture 0.6 to 0.75

Condenser 0.7/0.85 *(46 55 06)* for objectives with aperture 0.4 to 0.6

4.1 Adjusting darkfield

- Focus specimen with objective 10 or similar initial magnification
- First center the field diaphragm image either with condenser V/Z *(46 52 77)* in position Ⓙ or with another condenser under brightfield illumination. Then set the revolving disk (**12**.7) of the condenser V/Z to Ⓓ or
- Insert a darkfield condenser instead of a brightfield condenser.
- Turn knob (**7**.5) to adjust height of darkfield condenser, so that the light spot is as small, bright and sharply defined as possible.
- Using centering screws (**7**.4) bring the field diaphragm image to the center of the field of view.
- Open the field diaphragm (**7**.8) until is disappears beyond the edge of the field of view.
- After changing an objective readjust the field diaphragm.

4.2 Darkfield with oil immersion

- Switch condenser V/Z *(46 52 77)* into position Ⓓ or
- Insert ultra condenser *(46 55 00)* into condenser holder Z *(46 55 42)* with screwed in auxiliary lens EL.
- Adjust specimen and field diaphragm image, as described under point 4.1
- Apply a small quantity of immersion oil without air bubbles to the condenser front lens (**16**.2). Place the specimen on to the specimen stage and raise condenser with control knob (**1**.10) until the immersion oil touches the specimen slide.
- Switch the immersion objective into the light path. It must be equipped with an iris diaphragm (**16**.1) if the objective aperture is greater than 1.0.
- Press the objective front lens against its spring mount and lock it by turning clockwise. Apply immersion oil without air bubbles to the cover glass. Lower the objective front lens into the immersion oil.
- Narrow the objective iris diaphragm (**16**.1). Focus the specimen. Readjust the field diaphragm. Open the iris diaphragm, but nor too far, so that the background remains dark.

16

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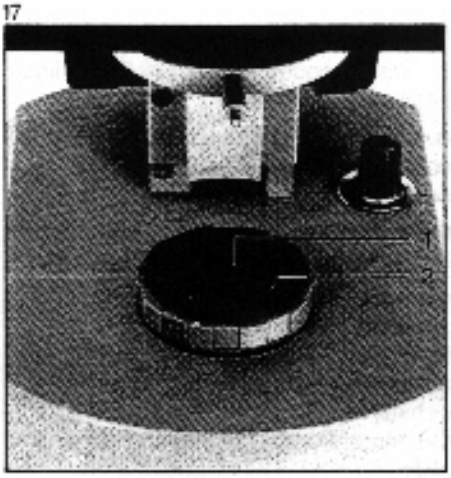

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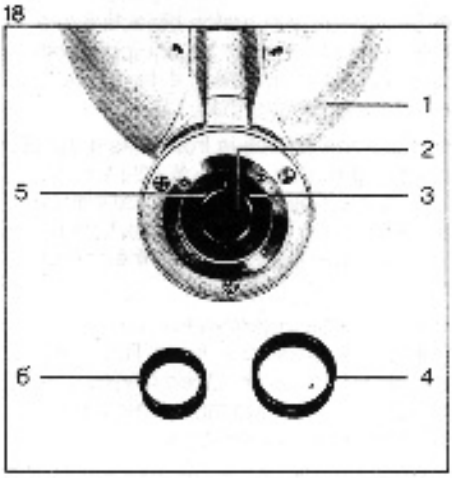

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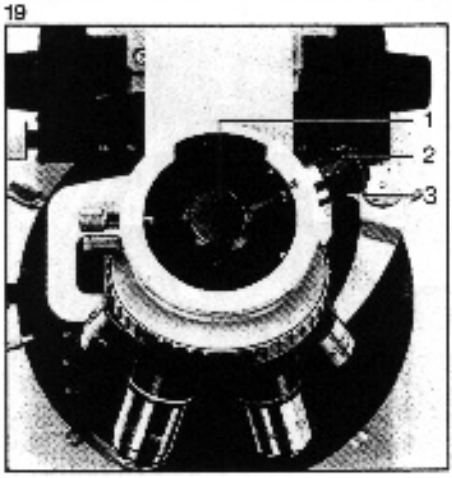

Equipment for simple polarized light observations (orthoscopic observation).

Polarization filter *(473600)* (**17**.1)
Place it on the filter holder over the field diaphragm. The two white index lines on the edge of the mount indicate the oscillation direction and should lie in east-west (horizontal) direction.

Analyzer *(473651)* (**18**.2)
can be screwed into the tube.
When using the binocular tube *(473011)* (**18**.1), the adapter ring M 24/30 *(473695)* (**18**.3) should be screwed onto the tube; then the analyzer should be screwed in from below using the spanner (**18**.6).
Two white index lines indicate the oscillation direction of the analyzer. With the attached tube it should run north-south (vertical) i.e. at right angles to the oscillation direction of the polarizer. Fix the orientated analyzer with screw (**18**.5).

Analyzer changer *(473670)* **or analyzer with and without lambda plate** *(433607)* **on changer**

The assembly of the changer is described on page 13.

- Switch the analyzer alone or analyzer with lambda plate (**19**.1) using the control button (**19**.2) into the light path.

For exact cross position turn tube or polarizer (**17**.1) slightly. The background is then at its darkest.
Upon rotation of the stage only birefrigent details will light up.

Focusing the specimen in polarized light

as for brightfield, see section 2.2, page 8, also

- cross polarizers
- narrow the condenser diaphragm (**7**.2) more than with brightfield

7 Halogen lamp exchanging and adjusting

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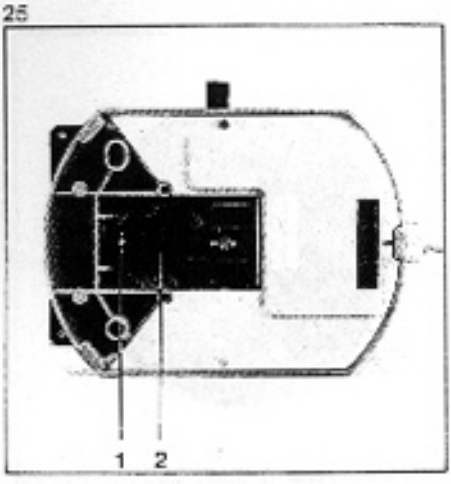

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6 V 10 W halogen lamp (38610 08)
To change lamp:

Lay the microscope on its side (Fig 25). Loosen knurled screw (**25**.1) and remove lamp holder (**25**.2).

Remove lamp from the two metal clips (**26**.1). Holding the new lamp in the plastic cover supplied with it, insert lamp into holder. Wipe off all finger marks, otherwise these will burn in when the lamp is used.

To adjust lamp:

Look at lamp and check that filament and its reflection are aligned in the concave mirror and that they match in size.

Loosen screw (**27**.1) and push lamp along holder until the setting shown in Fig **28** is achieved. Now tighten screw (**29**.1) until filament and reflection appear to be the same size (Fig **30**).

After completing adjustment, replace lamp housing in diaphragm insert with ground glass and firmly tighten knurled screw (**25**.1).

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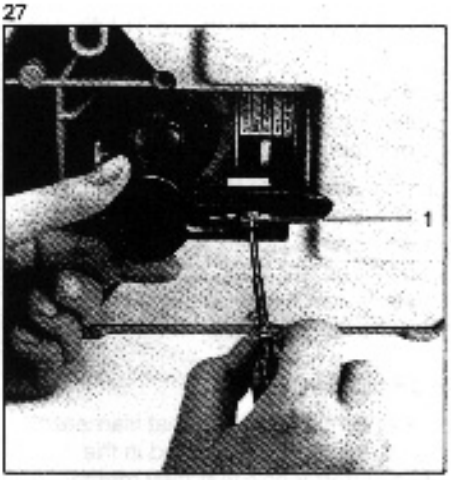

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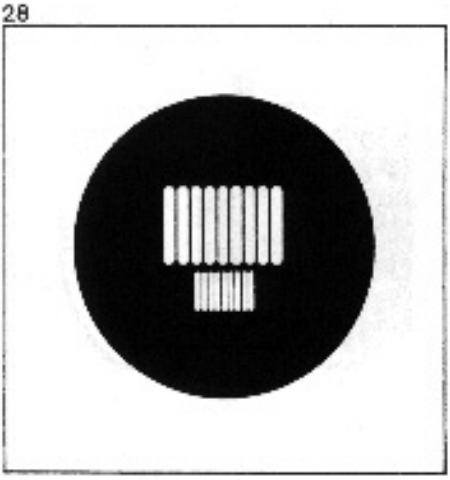

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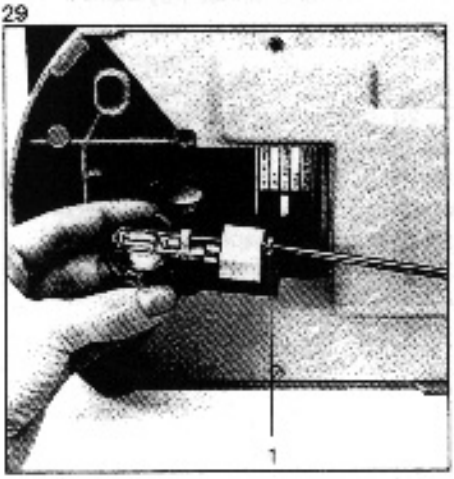

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