

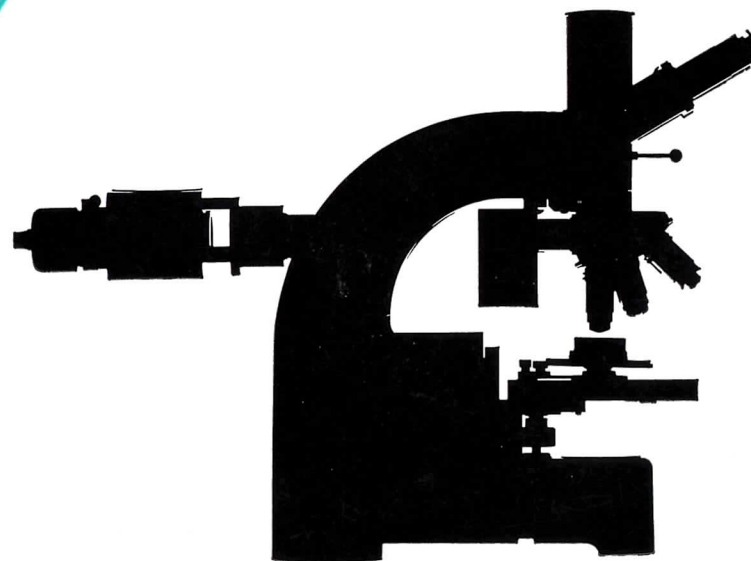


# METALLUX

with phase contrast outfit  
and built-in illuminator



## Instructions



Design subject to alteration without notice.

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## Instructions

### 1 Dispatch and unpacking of the microscope

For dispatch, the microscope tube, diaphragm drum, and revolving nosepiece with the objectives are removed from the stand. They are packed in the shipping case together with the lamp housing and the small accessories.

The regulating transformer is packed separately.

During unpacking, check the packing material for small parts and compare the items with the packing note immediately. Place the unpacked parts on a clean table so that they are ready at hand for assembly.

All mechanical and optical parts are carefully cleaned before dispatch; they must therefore be scrupulously protected from dirt and dust; glass surfaces, especially those of objectives and eyepieces, must never be touched by hand. Any fingermarks on glass surfaces must be at once removed with a piece of soft chamois leather or a well-washed linen rag. Even minute traces of finger grease can quickly attack surfaces of high-quality glasses.

### 2 Workroom and work place

The workroom should meet some basic requirements. It should be as far as possible free from dust, oil fumes, and **chemical vapours** liable to attack the optical and mechanical parts of the microscope. The temperature should be as constant as possible.

### 3 Assembling the microscope

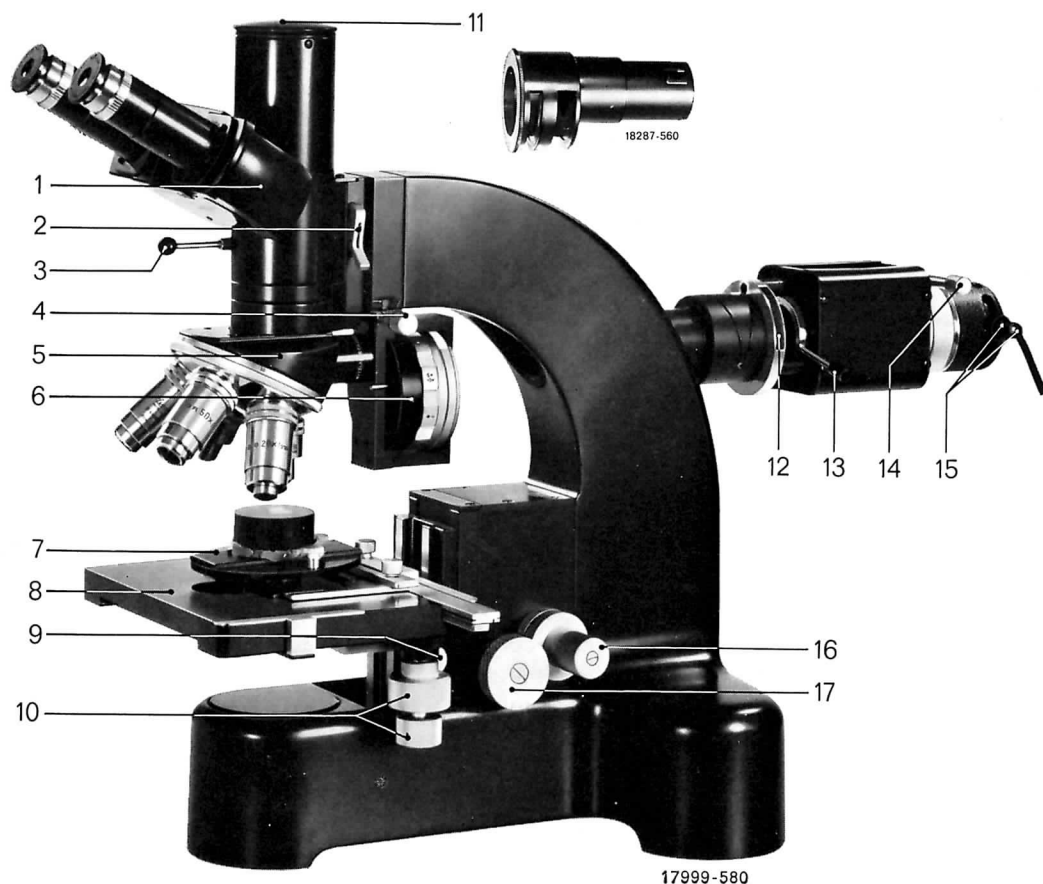


Fig. 1  
METALLUX with phase contrast outfit

- 1 binocular photo tube
- 2 arresting lever of the microscope tube.  
When the tube is to be removed from the stand this lever must be lifted.
- 3 swing-out prism for observation and photography
- 4 knurled screw for clamping the diaphragm drum
- 5 detachable vertical illuminator with matched objectives
- 6 diaphragm drum
- 7 universally tilting object holder, to be mounted on the mechanical stage, permitting rapid and perfect alignment of the object
- 8 76 x 40mm object stage
- 9 after this clamping screw has been released the object stage can be vertically adjusted
- 10 knobs for adjusting the mechanical stage
- 11 tube cap. After its removal photomicrographic devices can be mounted (such as the LEICA®, ORTHOMAT®, or NORMCAM 6.5 x 9cm)
- 12 filter slot
- 13 lever for adjusting the lamp condenser
- 14 clamping screw for the lamp mount
- 15 centring screws for the low-voltage lamp
- 16 fine focusing mechanism for the microscopic image
- 17 coarse focusing mechanism for the microscopic image

1. Insert the object stage carrier piece into the dovetail guide of the stand, slide it down as far as possible and clamp it with screw 9 on the right.

2. Fully insert the diaphragm drum 6 from the right into the dovetail guide provided, and clamp it with the knurled screw 4.

3. Slide the revolving nosepiece, with the objectives in position carefully into the dovetail guide from below, and clamp it with the screw 22.

4. Fully slide the (monocular or binocular) tube into the dovetail guide of the stand from above, lifting the lever 2. After this lever 2 is released the tube is fixed and aligned to the optical axis. For tube change this arresting lever must also be lifted.

5. Insert the lamp housing into the tube of the stand. After the clamping screw 14

is released the centring mount of the bulb can be pulled out. After the bulb has been changed, fully insert the centring mount into the lamp housing and clamp it with knurled screw 14.

Check the centring of the lamp after each bulb change. Set the lamp condenser (lever 13) so that an image of the light source is formed on the back of the diaphragm drum 6.

The image must now be centred to the aperture of one of the annular stops by means of the centring screws 15. The 6v 5amp low-voltage filament lamp can be run on a maximum current of 6 amp. Its light is very intense and has a particularly favourable spectral composition. The lamp should be connected to the mains only through the transformer provided. Before using it for the first time, make certain the type of current and mains voltage are identical on the voltmeter and the rating plate of the transformer.

## 4 Vertical illuminator for phase contrast or brightfield

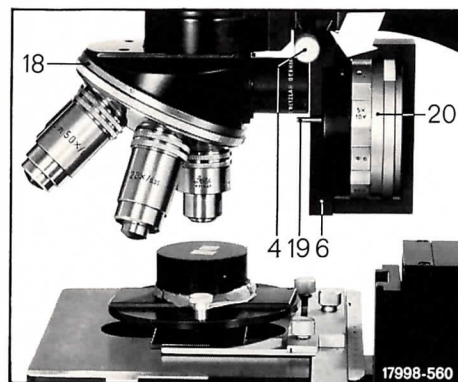


Fig. 2  
4 diaphragm drum clamping screw  
6 diaphragm drum for phase contrast  
or brightfield illumination  
18 the number engraved here indicates  
the microscope magnification set  
19 lever for switching on the orientating  
brightfield illumination  
20 index mark for setting the aperture required  
for phase contrast or brightfield

After insertion against the stop (to be fixed with clamping screw 22) the revolving nosepiece with the objectives is aligned to the diaphragm drum. On the spot numbered 18 the current microscope magnification can be read off. Example: if the number 1000 faces the number 18, the total magnification of the microscope is 1000x, and the associated objective of 100x primary magnification is turned into the beam path below the microscope tube. The objectives have their primary magnification and numerical aperture engraved on the mount. Should they be removed for any reason from the nosepiece care should be taken that they are replaced in the correct threaded hole, i.e. exactly opposite the corresponding total magnification engraved on the revolving nosepiece. The objectives are parfocal, so that after magnification change the image of the object will always remain within the sharpness range, and only a slight adjustment of the micrometer fine focusing mechanism 16 of the stand may become necessary. The magnification is changed simply by a turn of the revolving nosepiece, without a change of eyepieces: always use the paired 10x eyepieces (or single 10x eyepiece).

Centring the annular stop in the diaphragm drum.

The annular stop for phase contrast and the iris diaphragm for brightfield are centred to each other and to the optical axis. As a rule, light ring and phase ring are therefore made to coincide only when the object holder 7 is tilted according to Fig. 4.

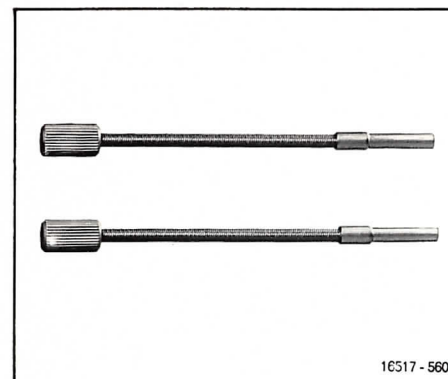


Fig. 3  
Centring keys

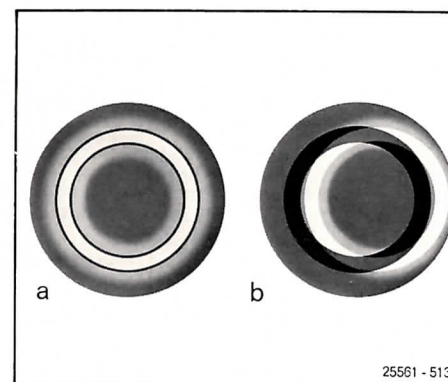


Fig. 4  
Phase ring and light ring as seen  
in the auxiliary magnifier  
a) light ring centred to the phase ring  
b) light ring off-centre to the phase ring

If necessary, recentre the annular stops as follows:

1. Place the polished section on the tilting object holder, and focus it.
2. Remove one objective from the nosepiece; unscrew clamping screw 4, remove the diaphragm drum 6; remove an eyepiece from the tube and replace it by the auxiliary magnifier.
3. Turn the empty aperture of the revolving nosepiece into the beam path. Tilt the object holder so that the light spot of the filament lamp will be in the exact centre of the field of view of the auxiliary magnifier. The section is now aligned vertically to the optical axis of the microscope.
4. Replace the objective in the empty aperture. Insert and clamp the diaphragm drum.
5. Turn in a medium-power objective, (e.g. 20x) and adjust the diaphragm drum accordingly. During observation through the auxiliary magnifier light ring and phase ring must now coincide precisely (cf. Fig. 4a).

If this setting cannot be obtained with this technique, Fig. 4b, the annular stop must be recentred.

6. Insert the centring keys Fig. 3 into the two upper grub screws of the diaphragm drum (to the right and left of the top part of the microscope), see arrow Fig. 2.
7. Rotate the centring keys until light ring and phase ring coincide (cf. Fig. 4a). Remove the keys.
8. Proceed in the same manner with all the other objectives.



In order to be able to centre the aperture diaphragm accurately at the brightfield position of the diaphragm drum, preferably close it completely.

After the desired magnification has been set on the revolving nosepiece, the associated annular stop must be set on the diaphragm drum 6 for phase contrast illumination. If, for instance, 200x magnification is set on the revolving nosepiece, the number 200 must also face the index mark 20 on the diaphragm drum with phase contrast illumination. The diaphragm drum clicks into the correct position.

The phase contrast annular stop of the drum for 100x magnification also serves for 50x magnification. However, the 200x, 500x and 1000x magnifications each have their own phase contrast annular stop.

If observation is required in brightfield, the diaphragm drum must be rotated so that the word "Brightfield" comes to rest above the index mark 20. This setting is correct for **all** magnification ranges in **brightfield** (unlike in phase contrast illumination, where each magnification range has its own annular stop). The brightfield illuminator also incorporates an aperture diaphragm 21. This optimum image setting (in brightfield) can be obtained in all magnification ranges with the brightfield illuminator.

The field diaphragm is permanently built in. If during the observation of an object in phase contrast orientating comparison with the brightfield image is required, operate the lever 19: when it is depressed, the phase contrast beam in each magnification range is affected so that bright-

field illumination suitable for general comparison purposes is produced without the need for adjusting the diaphragm drum. The observer is thus able to examine his object in phase contrast immediately succeeded by brightfield.

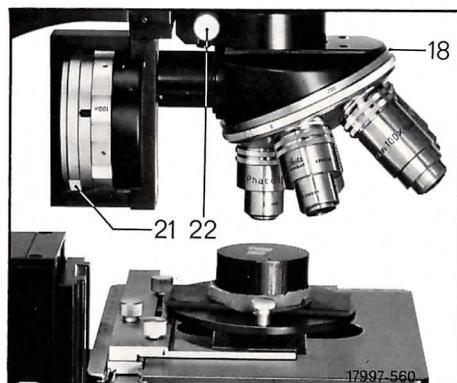


Fig. 5  
18 the number engraved here indicates the microscope magnification set  
21 aperture diaphragm of the brightfield illuminator  
22 clamping screw on the carrier piece of the revolving nosepiece

## 5 Operating the microscope

Impress the object (polished section) in plasticine on the object slide with the aid of the hand press.

The section must be completely plane; it is best to mount it in suitable clamping devices or embed it in synthetic resin during preparation.

Clamp the object on the universally tilting object holder, which is placed on the object stage and roughly levelled. (In order to avoid contact with the objectives, lower the object stage with the drive knobs 17; it can be fixed with the clamping screw 9).

Switch on the lamp, adjust it to about 4amp. Focus the eyelens of the graticule eyepiece on the graticule.

Set the revolving nosepiece at 200x magnification. Rotate the diaphragm drum 6 so that the number 200 is inside the index mark 20.

Slowly raise the object or object stage by means of the knobs 17, until the micro-

scopic image appears in the graticule eyepiece; if necessary refocus with the fine focusing adjustment 16. Replace one eyepiece with the auxiliary magnifier supplied, rotate the eyelens of the auxiliary magnifier so that the phase ring and light ring appear sharp. Now align the universally tilting object holder so that the light ring is precisely concentric with the phase ring. This is the only way of ensuring a perfect phase image.

Readjustment is now no longer required after a change of magnification.

When a binocular tube is used focus the eyepiece without graticule on the microscopic image by adjusting the eyelens.

Check illumination for evenness by adjusting the lamp condenser 13.

The object stage can be adjusted in its dovetail guide corresponding to the height of the object after the clamping screw 9 has been released.

## 6 Photomicrography

An attachable 6,5x9cm camera is available for photomicrography; it includes a negative eyepiece, time- and instantaneous shutter, and a groundglass screen interchangeable with the darkslide. Below extension is unnecessary as the microscope is adjusted for the standard magnifications. Photomicrographs at 50x magnification should be focused on the groundglass screen; however, at magnifications from 100x to 1000x the pictures can be taken after they have been focused with an eyepiece without reference to the groundglass screen.

For serial photography the LEICA 35mm camera can be used in combination with the VISOFLEX® micro-mirror reflex attachment. The paper print enlarged to 6.5 x 9cm corresponds to the standard magnification of the microscope. Our outfit list contains detailed information about the various outfits.



Fig. 6  
NORMKAM