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LEITZ LABORLUX S

Microscope for the examination of transparent objects
Instructions

WILD LEITZ

1 Care and Maintenance

Dust protection is provided by a flexible dust cover which should always be used when the instrument is not in use. The stand should be cleaned from time to time with a linen or leather cloth; alcohol must not be used as it attacks the paint, but petroleum is well suited for cleaning the painted surfaces. Pale spots on the object stage can be removed by rubbing with paraffin oil or vaseline.

Particular care should be taken when undertaking studies using acids or other aggressive chemicals. Direct contact of these substances with the stand or optics must be avoided under all circumstances, and all parts should be carefully cleaned after use. The optics must be kept scrupulously clean. Dust can be removed from glass surfaces by means of a dry, fine-haired brush, blowing gently across the surface whilst brushing. If the dirt is difficult to remove, a clean cloth, moistened with distilled water, can be used or, if this also has no effect, pure alcohol may be applied. Particular care should be taken when cleaning anti-reflection coatings. The outer eyepiece surfaces and the front elements of the objectives have coatings of approximately the same hardness as glass and must be correspondingly carefully cleaned.

Objectives should not be screwed apart during cleaning. If damage or dirt is noticed inside them, they should be returned to us for repair. Cleaning of the inner surfaces of the eyepieces is also advised against.

Microscopes being used in hot and/or humid climates require special care. It should be ensured that a build-up of fungus does not occur, which is managed, in the first place, by thorough and meticulous cleaning and storage in a cupboard whose inside temperature is at least 5 °C above that of the room. It must also be provided with airing holes, loosely plugged with cotton wool or gauze as protection against dust. If this type of storage is not possible, the microscope must be kept in a closed container with an adequate amount of drying agent (e.g. silica gel). These measures should be taken even in laboratories with air conditioning. In warm and dry climates, dust is the greatest enemy. The instrument should, therefore, be covered with the dust cover immediately after use or cleaning and stored in a cupboard. If a humid period of longer than one month occurs, storage in a warm cupboard, as described above, is desirable.

Proper handling of the microscope will ensure decades of service. If, however, a check over or repair becomes necessary, please contact your Leitz agency or our Technical Service direct.

Technical Service
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Postfach 20 07
D-6330 Wetzlar,
West Germany.
Telex: 483 727 eltsc

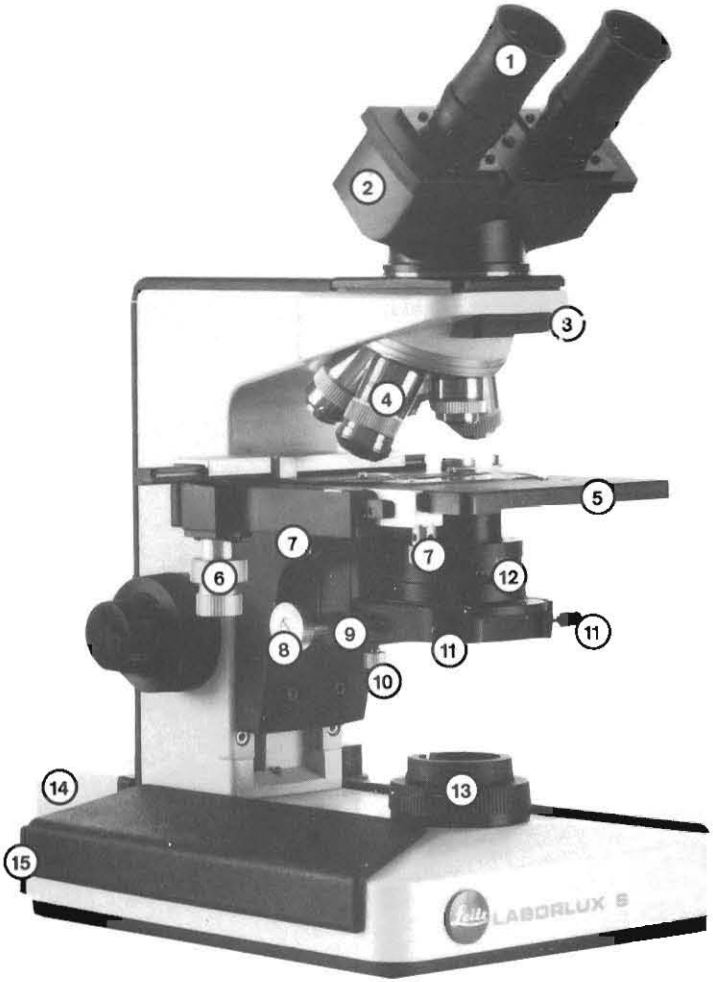


Fig. 1
Leitz LABORLUX S with stage no. 11, condenser no. 56 and binocular tube S.

1 Eyepiece
2 Binocular tube S 45°
3 Analyser slit
4 Objectives
5 Specimen stage no. 11
6 Coaxial drive for moving the specimen
7 Screws to attach object guide no. 12
8 Height adjustment of the condenser mount
9 Condenser mount with slide changer
10 Adjustable height stop of the condenser mount
11 Centring screws for condenser mount
12 Condenser no. 56
13 Field diaphragm
14 Lamphousing 20
15 Mains switch (concealed)

2 Assembling the microscope

Mounting the tubes

Press the lever in the direction of the arrow (Fig. 2); the tube can now be inserted into the quick-change mount. Once the tube has been inserted allow the lever to slide back. The tube can be rotated by 360° and clamped in any position by slightly pulling the lever.

Inserting the eyepieces

The eyepieces are inserted into the eyepiece tubes (Fig. 3). For the LABORLUX S, Leitz eyepieces are used which are calculated for the mechanical tube length of 160 mm. These eyepieces are distinguished from those for 170 mm tube length by the additional identification of the field of view index after the magnification, e.g. 10x/20. If Leitz eyepieces without this identification of the field of view index are to be used, a spacer ring (order no. 519 653) must be pushed over the eyepiece mount on the side of the tube.

Fig. 2 Mounting the tubes

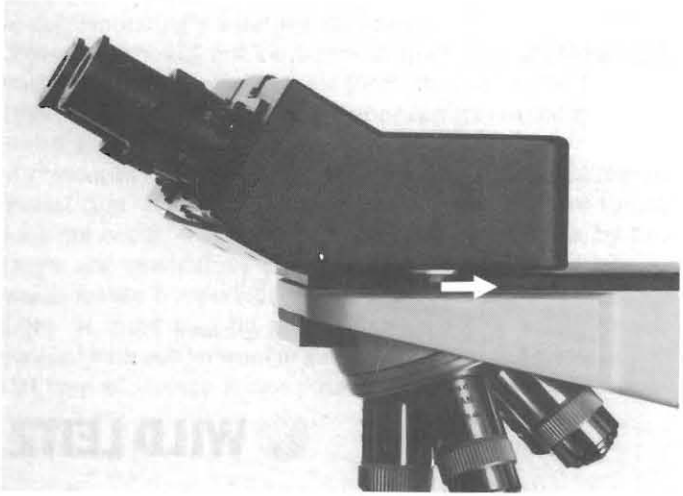
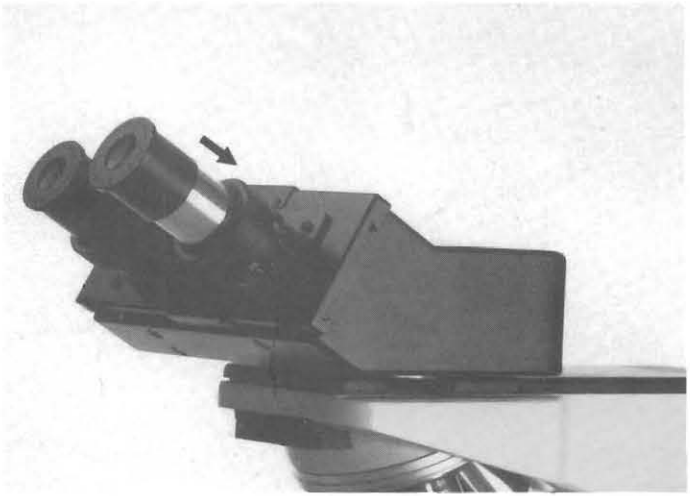


Fig. 3 Inserting the eyepieces



The total magnification of the microscope is given by: reproduction ratio of the objective x eyepiece magnification (x tube factor).

Example:
25/0.50 objective
10x/18 eyepiece
tube factor 1x
Total magnification: 25 x 10 x 1 = 250x

Screwing in the objectives

Screw the objectives into the nosepiece (Fig. 4) in such a way that stepwise magnification change is possible (e.g. in the order 4, 10, 40, etc).
All Leitz microscope objectives from a magnification of 2.5x and calculated for a tube length of 160 mm can be used on the Leitz LABORLUX S. Please note in this context the field illumination capacity of the condensers.
Microscope objectives calculated for 170 mm tube length can be used from 16x magnification.

Fig. 4 Screwing in the objectives

Identification markings on the objectives
(Fig. 5)

1 Mechanical tube length

The distance in mm from the objective shoulder to the edge of the tube.

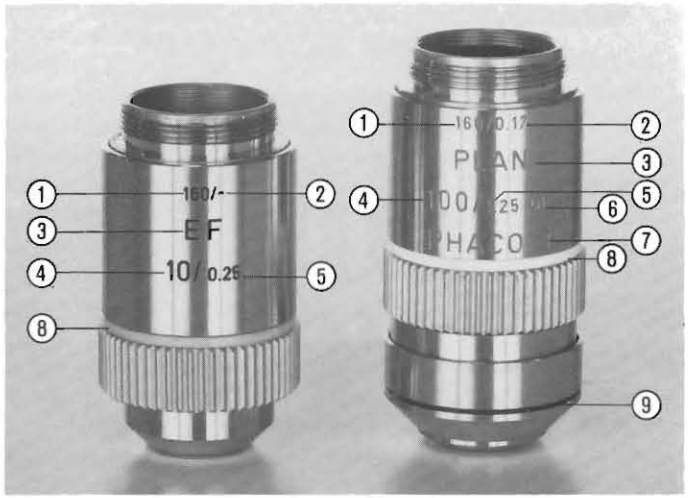
2 Coverglass

The engraving 0.17 is the thickness of the coverglass.
A dash (-) instead of a number indicates that the objective can be used for specimens with or without a coverglass.

3 Field flatness of the objective

EF objectives are systems with a more or less flat field of view of up to 18 mm intermediate image diameter.
PLAN objectives are systems with a flattened field of view up to 22.5 mm intermediate image diameter.

Fig. 5 Objective identification



If there is no indication of field flattening, the objective is an achromat with optimum correction, for use with up to 18 field of view index.

4 Reproduction scale in the intermediate image

Size ratio between the intermediate image and the object, e.g. 10 : 1

5 Numerical aperture

Physical identification of the objective's resolving power

6 Immersion medium

Immersion media can be, for example, oil, water (W) or glycerine (GLYC). The objective must always be used with the engraved immersion medium.
Before the immersion objective is focused, a drop of immersion medium should be applied to the object without air bubbles.

7 Phase contrast objectives

Objectives with phase ring for phase contrast observation. These objectives have green writing (with the exception of achromats with black sleeves). The label for the condenser-side annular stops necessary for these objectives (e.g. PHACO 3) in a slide or in the turret plate of the UKL phase contrast condenser (e.g. PHACO 3 = set turret plate to 3) is also to be found on the phase contrast objectives.

8 Coloured ring indicating the objective magnification

9 Immersion objectives

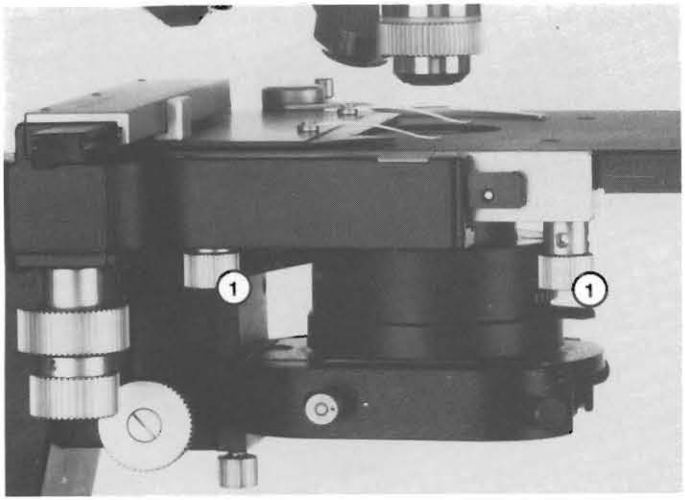
Attaching the object guide

The object guide no. 12 for left- or right-hand operation is attached to the left or right of the specimen stage with two screws (6.1).

Inserting the condensers

Rotate the condenser clamp (2) until the dots on the knurled knob and on the condenser mount coincide. Then lower the condenser using the knob (7.1) until the condenser (7.6) can be easily pushed into the mount as far as the stop. Now turn the condenser clamp in the direction of the arrow. The condenser is now firmly fixed in the slide changer. Condensers LK and UKL are inserted in the same way as condenser no. 56 (illustrated, 7.6).

Fig. 6 Attaching the object guide
1 Fixing screws for object guide no. 12

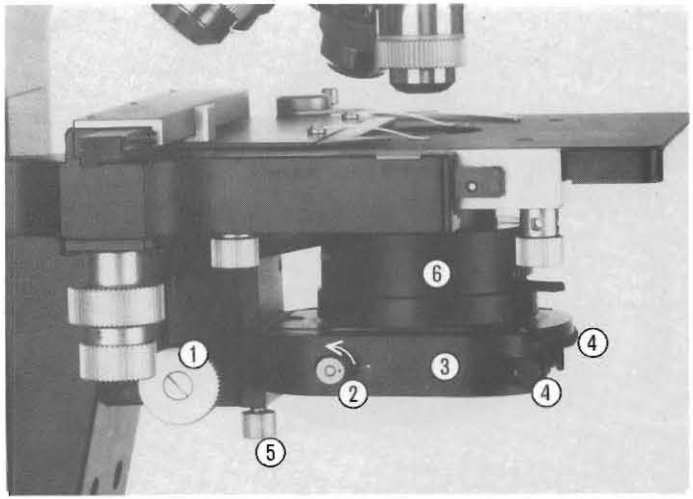


Condenser no. 56

With the two-lens condenser no. 56, homogeneous illumination is possible for all object fields of objectives from 4x magnification at field of view index 20 without additional swinging in and out of the front lens.

Condenser no. 56 works with the numerical aperture A 0.90. If oil cap no. 512 652 is screwed on, the numerical aperture can be raised to A 1.25 when Leitz immersion oil is applied between the condenser and the specimen. To screw the oil cap on, the protective ring must be screwed off with a knurled ring.

Fig. 7 Inserting the condenser
1 Height adjustment of the condenser holder
2 Condenser clamp
3 Condenser holder
4 Centring screws for condenser mount
5 Adjustable height stop for the condenser holder
6 Condenser no. 56

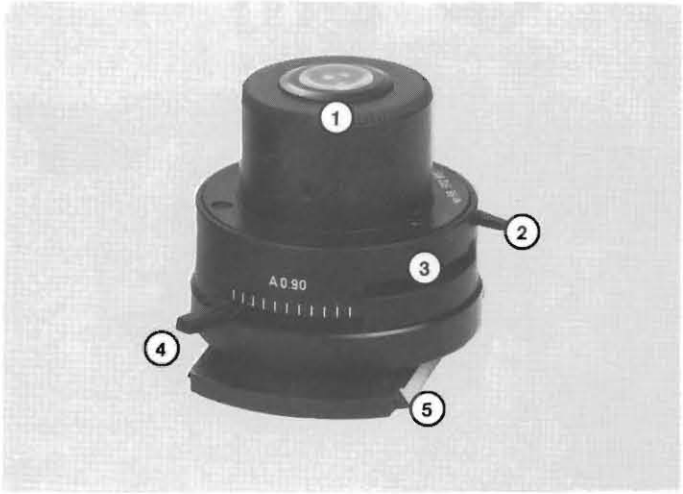


The aperture diaphragm is adjusted with the lever. There is a scale for reproducible setting of the condenser diaphragm. The slit at the side is intended for the insertion of slides with annular stops for simple darkfield or phase contrast illumination. These can only be taken out of condenser no. 56 again after the lever has been pressed.

Condenser LK

The LK condenser has a hinged condenser top S 1.1. When the condenser top is swung out, the lower part of the condenser can illuminate all object fields of objectives from 2.5x upwards with field of view index 20. When using objectives of 10x and higher the condenser top must be swung in. This is done with the handle (8.2).

Fig. 7b Condenser no. 56
1. Protective ring
2. Locking lever for slide with diffusion disc and annular stops
3. Slit for slide with diffusion disc and annular stops
4. Lever for adjustment of aperture diaphragm
5. Dovetail guide



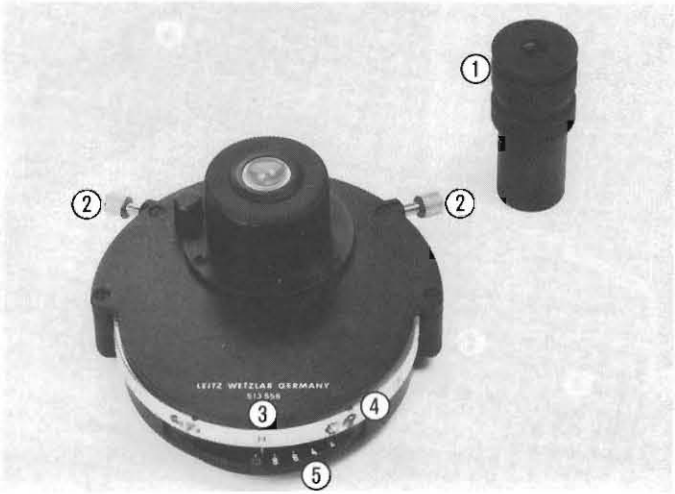
With condenser top A 0.90 S 1.1 swung in, the condenser LK works with the numerical aperture A 0.90. The image of the field diaphragm is produced with the condenser top S 1.1 in a glass medium 1.2 mm over the stage surface.
The condenser top of the LK condenser is interchangeable via a thread with other condenser tops with a higher numerical aperture or tops with a longer working distance. Darkfield condenser tops D 0.80 or D 1.19 can also be screwed on instead of the S 1.1 standard top. Further information on condenser tops can be found in the table on page 10.
The aperture iris diaphragm is adjusted with the lever (8.3). There is a scale for reproducible setting of the condenser diaphragm.

Fig. 8 Condenser LK
1 A 0.90 S 1.1 Condenser top
2 Handle to swing out the condenser top
3 Lever for adjustment of the aperture diaphragm

Condenser UKL

Its performance features in brightfield are the same as those of the condenser no. 56.
The annular stops necessary for phase contrast or darkfield illumination are situated in a turret plate (9.4) for quick change. Position "H" (9.3) of the turret is for brightfield (Hellfeld) investigations. Positions 1, 2 and 3 accommodate the annular stops PHACO 1, 2 and 3. These can be aligned to the phase ring of the objective in use by pushing in the two centring screws (9.2). Position 4 is occupied by an annular stop for darkfield with objectives from 10x to 40x.
The wheel (9.5) is for adjusting the aperture diaphragm, only necessary for brightfield investigations. It is fully opened for phase contrast or darkfield (PH position).

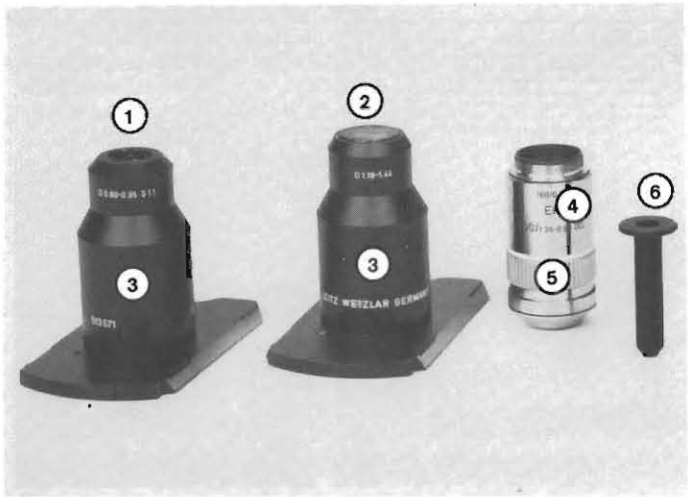
Fig. 9 UKL condenser
1 Adjustment telescope for centring the annular stops
2 Centring screws (press in to use)
3 Turret plate position indication
4 Turret plate
5 Adjustment wheel with scale for aperture diaphragm



Darkfield condensers D 0.80 and D 1.19

The condenser D 0.80 is intended for darkfield investigations with 10x to 40x objectives. Image contrast is optimised here as compared with the darkfield produced with annular stops.
The condenser D 1.19 has an oil immersion cap and is used together with oil immersion objectives. The darkfield condenser caps are also available without bottom parts and can be screwed onto the bottom part of the LK condenser.

Fig. 10 Darkfield objective and funnel stop
1 Condenser top D 0.80 - 0.95 S 1.1
2 Oil condenser top D 1.19 - 1.44
3 Lower part of condenser with dovetail guide
4 Special darkfield objective EF 100/1.25 - 0.60 Oel with built-in iris diaphragm
5 Knurled ring for adjustment of the iris diaphragm
6 Funnel stop for the oil immersion objective



Condenser LK

Condenser Top	Top in/out	Use
0.90 S 1.1	Out	With objective aperture <0.25
0.90 S 1.1	In	With objective aperture >0.25
OEL 1.32	In (Immersion oil on front element.)	With OEL 100/1.32 objective
0.70 S 4	In	Intercept distance 4 mm. With specimen slides of thickness >1 mm.
0.55 S 15	In	Intercept distance 15 mm. With specimen slides of thickness >6 mm.
D 0.80–0.95	Condenser top in light path	Darkfield. With objective apertures <0.75.
D 1.19–1.44	Condenser top in light path (Immersion oil on front element.)	Darkfield. With objective apertures <1.10.

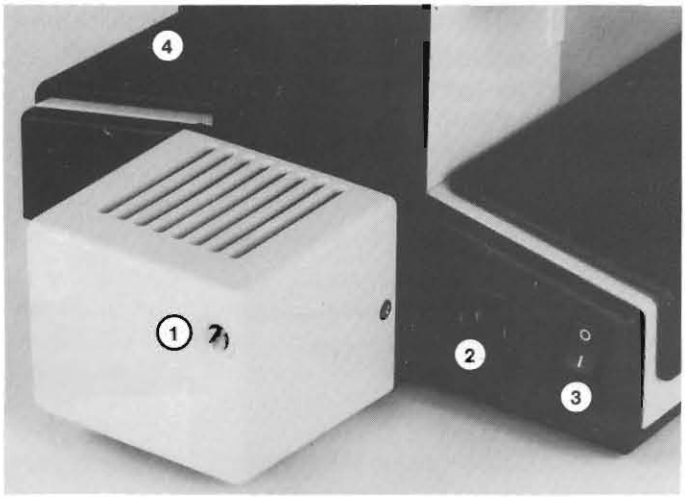
UKL universal condenser for phase contrast

Condenser top	Revolver setting	Objective with engraving	Application
0.90 S 1.1	H	All objectives	Brightfield
	1	PHACO 1	Phase contrast
	2	PHACO 2	Phase contrast
	3	PHACO 3	Phase contrast
	5	All objectives with aperture <0.75	Darkfield

Attaching the lamphousing 20

Lamphousing 20 is plugged into the guide sockets situated at the back of the stand and secured with the screw (11.1) (you may find it handy to use a coin). Then connect the microscope via the connecting socket (11.2) with the mains cable to the mains. The switch (11.3) is for switching the illumination on and off. The lamp intensity can be regulated with the knurled knob (11.4).

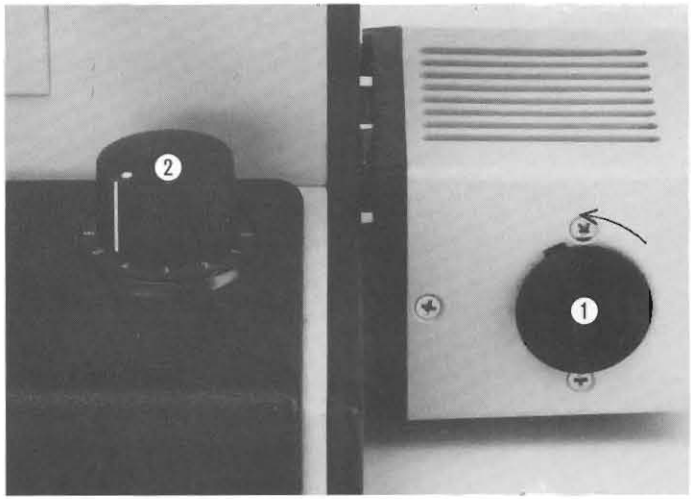
Fig. 11 Attaching lamphousing 20
1 Fixing screw
2 Connecting socket for mains cable
3 On/off switch
4 Intensity regulation



Changing the lamp

Press the lamp socket (12.1), unlock by turning to the left and take it out of the lamphousing. Remove the defect lamp. When inserting the new lamp, do not remove its protective wrapping until the lamp is in position. Return the lamp socket to the lamphousing, press in and lock in place by turning to the right.

Fig. 12 Changing the lamp
1 Lamp socket
2 Intensity regulation

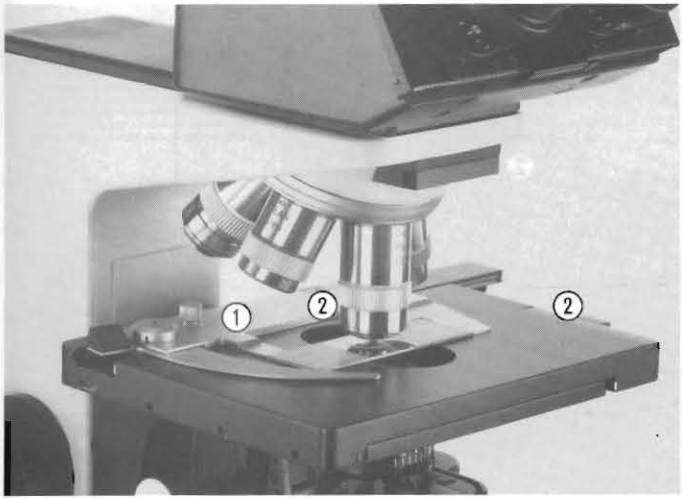


Operation of the microscope

Focusing the image

Place a specimen on the stage or slide it into the mounting plate (13.1) if available.
Specimen stage no. 11 (1.5) can be supplied with two clips to secure the specimen. Instead of these clips, object guide no. 12 can be attached to the left or right of the stage for left- or right-handed operation (Fig. 6).
It has an adjustment range of 76 x 26 mm.
Precise movement of the specimen within a range of 76 x 52 mm is possible with the mechanical stage no. 18 (Fig. 13).
The object guide no. 12 and mechanical stage no. 18 have a vernier scale (13.2) for adjustment of both the x and the y axis.

Fig. 13 Mechanical stage no. 18
1 Specimen mounting plate
2 Vernier scale



This enables certain parts of the specimen to be set reproducibly.

Turn in a medium-power objective e.g. EF 10/0.25 by rotating the nosepiece. Switch on the illumination (11.3) and regulate the intensity by turning knob (12.2).
Turn the screw (7.5) by approx. 5 rotations to the left and use the height adjustment (7.1) to move the condenser to the upper stop near the specimen.
With the LK condenser, the condenser top (8.1) is swung into the illuminating light path with the handle (8.2). If you change to objectives of less than 10x magnification afterwards, swing the condenser top out of the illuminating light path.
Open the aperture diaphragm (8.3) and the field diaphragm (1.13).

Adjustment of the binocular tubes

If using the binocular tubes, adjust the interpupillary distance until the images for both eyes completely cover each other and appear as a single circular image. Then transfer the interpupillary distance (14.1) to the scales (14.2) of the two eyepiece tubes.

How to compensate for vision defects:
Look through the right-hand eyepiece with your right eye and focus the specimen with the fine drive. Then watch the same part of the specimen with your left eye and rotate the left-hand eyepiece tube until the same part of the object is in sharp focus. Do not use the fine drive for this. This setting should be rechecked after centration of the condenser.

When using the binocular FSA or FSA-R photo tubes (Fig. 14) the tube length is automatically compensated when the eyepieces are set at the required interpupillary distance.

The symbols on the rotary knob of the binocular photo tubes mean:

→ 100 % light to the eyepieces

↳ 50 % light to the eyepieces,
50 % to the photo exit

↑ 10 % light to the eyepieces,
90 % to the photo exit

The viewing angle of the binocular SV and FSA-VR tubes can be adjusted by tilting the front part of the tube between 0 and 40°. The user can thus set or alter the viewing height to suit himself.

Centring the condenser and setting the field diaphragm

Focus the specimen using the coarse and fine drive.

1. Close the field diaphragm. Loosen the stop screw and raise the condenser to its uppermost position with the height adjustment (1.8).
2. Turn the condenser stop screw (1.14) to lower the condenser until the edges of the field diaphragm appear sharp.
3. Centre the image of the field diaphragm with the two centering screws.
4. Open the field diaphragm until it just disappears from the field of view.

Fig. 14 Setting the binocular tubes

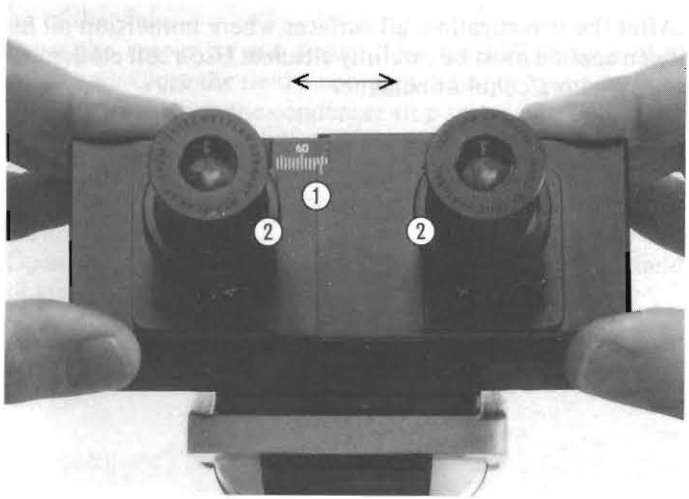
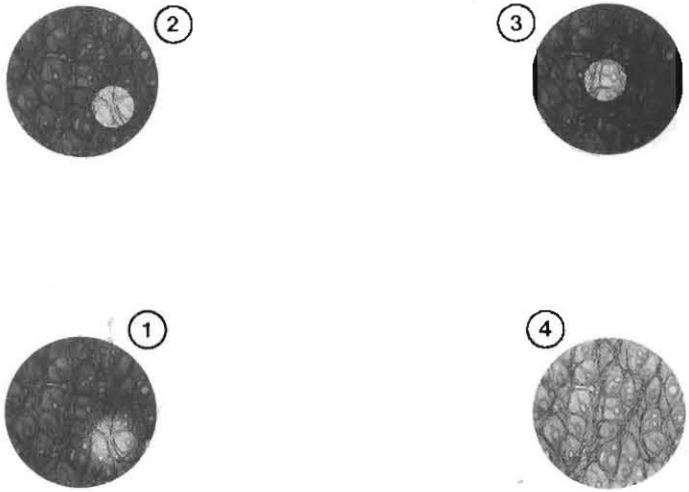


Fig. 15 Centering the condenser and setting the field diaphragm



Use of the field diaphragm

If optimum contrast is to be attained, it is important to illuminate only the part of the specimen that appears in the image. Therefore the field diaphragm is only opened as far as the field of view. For this reason, a change of magnification always necessitates matching the field diaphragm to the object field.

Use of the aperture diapbragm

The more the aperture diaphragm is narrowed, the higher the image contrast. Axial resolving power (image sharpness in the direction of the optical axis) also increases. However, excessive closure of the aperture diaphragm has an adverse effect on lateral resolving power (selectivity).
The best optical performance is obtained when the apertures of the objective and the condenser are the same.
A visible deterioration of resolving power is seen when the aperture diaphragm is closed over ⅓ of the aperture of the objective, and this should be avoided as far as possible. To check this, an eyepiece must be taken out of the eyepiece tube, the aperture diaphragm narrowed until its image covers ⅓ of the illuminated rear lens area. Replace the eyepiece.
If necessary, the aperture diaphragm can be narrowed further for objects with weak contrast.
Once determined, the aperture diaphragm setting can be reproduced with the aid of the scales on the brightfield and phase contrast condensers.

Note:
The aperture diaphragm should not be used to set image intensity. This is done with the rotary knob (12.2) for regulation of lamp intensity, or for photomicrography, with neutral light-blocking filters.

Oil immersion objectives

Oil immersion objectives are labelled with the additional engraving "OEL" and a black ring on the lower edge of the objective mount. They must always be used with immersion oil. Before the oil immersion objective is screwed into the nosepiece a drop of immersion oil must be applied to the specimen. Check that the immersion oil is free from air bubbles.
The immersion oil has almost the same refractive index $n_e =$ 1.515 as the coverglass and the front lens of the microscope objective. The focal length and the working distance of an immersion objective are usually very small. For this reason, working with oil immersions requires great care.
For routine work, the ordinary 0.90 condenser is adequate even for oil immersions. However, if the full aperture of the immersion objective is to be used, e.g. for very fine structures, the condenser aperture must also be enlarged. For condenser no. 56 this can be done by screwing on a 1.25 OEL condenser cap, or for the LK condenser, an APL OEL 1.32 S 1.1 condenser top. In these cases, immersion oil must also be applied between the condenser cap/top and the underneath of the specimen slide. After the investigation, all surfaces where immersion oil has been applied must be carefully cleaned. Use a soft cloth moistened with alcohol or benzine.

Transmitted light darkfield with the LK condenser

For darkfield investigations, condenser top D 0.80 - 0.95 is used when the objective has an aperture of less than 0.75 and condenser top D 1.19 - 1.44 when the objective's aperture is larger than 0.75.
For apertures greater than 1.10, insert a funnel stop into the oil immersion objective or use an objective with built-in iris diaphragm. Separate bottom parts are also available for the darkfield condenser tops, which are pushed into the condenser mount instead of the brigbtfield or phase contrast condensers.

Focusing the darkfield image (D 1.19 - 1.44 and D 0.80 - 0.95)

Put a specimen on the stage. Turn the condenser stop screw to the right as far as the stop. Insert the condenser and raise to the condenser stop.
If using the D 1.19 condenser top, first apply a drop of immersion oil to the surface of the condenser (taking care to avoid air bubbles) and then raise until the drop of oil touches the underneath of the specimen slide. This can be seen by a brief lighting up of the slide.
Bring the specimen into focus. (Use the 10/0.25 or 16/0.40 objective). Close the field diaphragm. Raise or lower the condenser by adjusting the condenser stop screw (1.10) to the left and using the condenser drive (1.8) until the edges of the diaphragm are as sharp as possible when the specimen is observed. Move the image of the diaphragm into the centre of the field of view with the two centring screws (1.11).
Open the field diaphragm until it just disappears from the field of view.

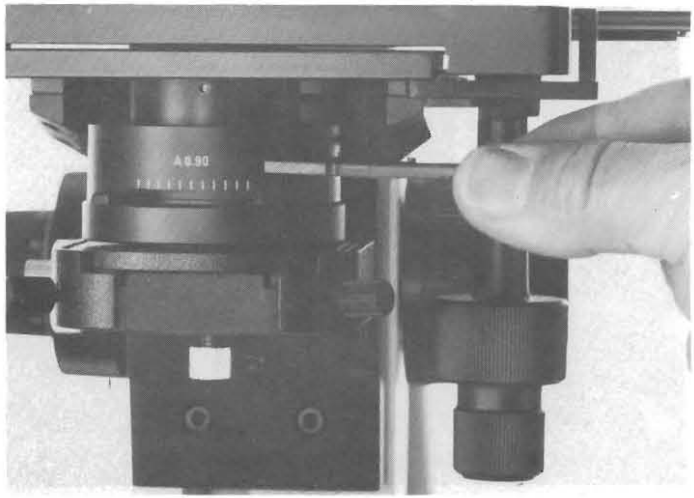
Phase contrast or darkfield illumination with condenser no. 56

Condenser no. 56 can be fitted with annular stop slides DF/PHACO for phase contrast or darkfield illumination:

- Centre the condenser with a brightfield specimen
- Screw in phase contrast objectives
- Open the aperture diaphragm
- Push the slide with the appropriate annular stop (chart on page 16) into the condenser (Fig. 16).

The DF/55-56 annular stop slide is also available for condenser no. 56, with which simple darkfield illumination can be obtained using objectives from 10x to 40x.

Fig. 16 Insertion of the slide with annular stop into condenser no. 56



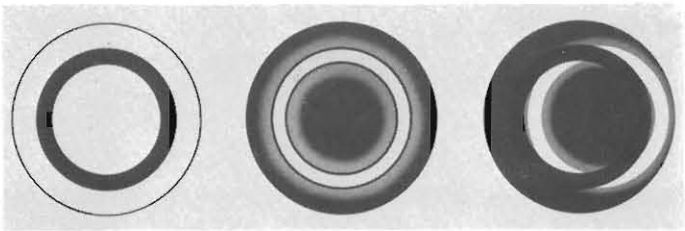
Phase contrast objectives

Annular stop	EF objectives	PLAN objectives	
1	10/0.25 PHACO 1	PLAN 10/0.25	PHACO 1
2	25/0.40 PHACO 2	PLAN 20/0.40	PHACO 1
	40/0.65 PHACO 2	PLAN 40/0.65	PHACO 2
3	100/1.25 PHACO 3	PLAN 100/1.25 OEL	PHACO 3

Phase contrast with the UKL universal condenser

Insert the UKL condenser into the condenser mount (1.9) and bring to its highest position with the vertical adjustment (1.8). Set the aperture diaphragm (9.5) to "10" (green). Put a specimen on the stage. Turn in the 10/0.25 PHACO 1 objective. Set the annular stop turret at position 1 and focus the specimen with the coarse and fine drive. Close the field diaphragm. Set the condenser with the vertical adjustment (1.8) so that the edges of the closed field diaphragm are in sharp focus. Centre the image of the field diaphragm with the two centring screws. Open the field diaphragm until it just disappears from the field of view. Remove an eyepiece from the eyepiece tube and insert the focusing telescope. Loosen the clamp ring on the focusing telescope and adjust the eyelens until light and phase rings are in sharp focus. Using the centring screws (press in and turn) adjust the light ring so that it is exactly covered by the phase ring of the objective. Centration must be carried out once for all objective/annular stop combinations and is then retained for all further settings.

Fig. 17 Phase ring and annular stop as seen through the focusing telescope.



Polarisation

Remove the protection piece from the analyser slit (18.1) and push the slide with the analyser (18.2) into the slit (18.1).
Insert the filter holder into the field diaphragm mount so that the open part faces the user. It should click into place.
Push the polariser (1) into the lower slit of the filter holder and turn until the field of view, observed without a specimen in place, appears at its darkest.
If desired, a compensator (λ or $\lambda/4$ plate) (19.2) can be used in the second filter slit above the polariser.

Fig. 18 Inserting the analyser

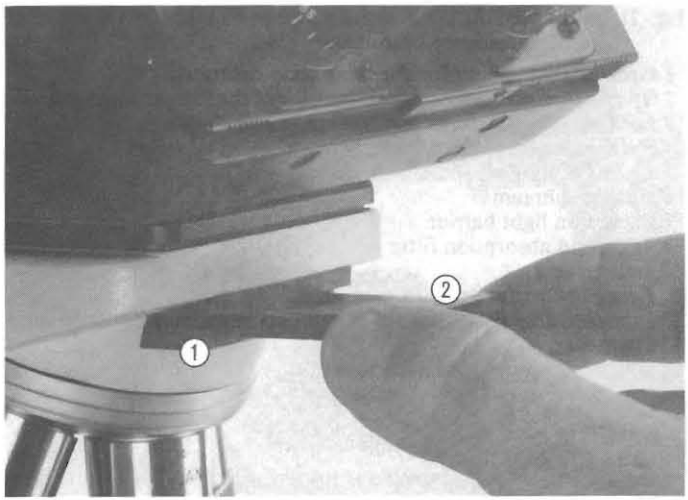
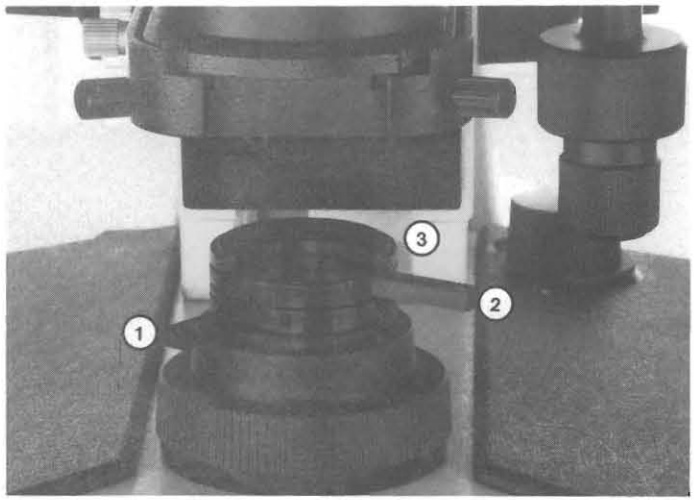


Fig. 19 Arrangement of the polariser
1 Polariser
2 Compensator
3 Holder



Incident light fluorescence

Assembly of the equipment

Attach the lamp holder (21.10) to the upper part of the stand with 2 Allen screws.
Unlock the observation tube (21.13) and remove from the stand. Place the PLOEMOPAK (21.5), with light shield attached, on the stand. Push the light shield (21.9) into the lamp holder.
Insert the observation tube into the tube mount of the PLOEMOPAK. This is done by pressing the lever (21.13) to the back and releasing once the tubus is in position. Attach the lamphousing (21.11) to the lamp holder, making sure that the clamping lever is in a vertical position. Clamp by turning the lever to the left. Remove the condenser and put the light trap in its place (Fig. 20).

Fig. 20 Inserting the light trap

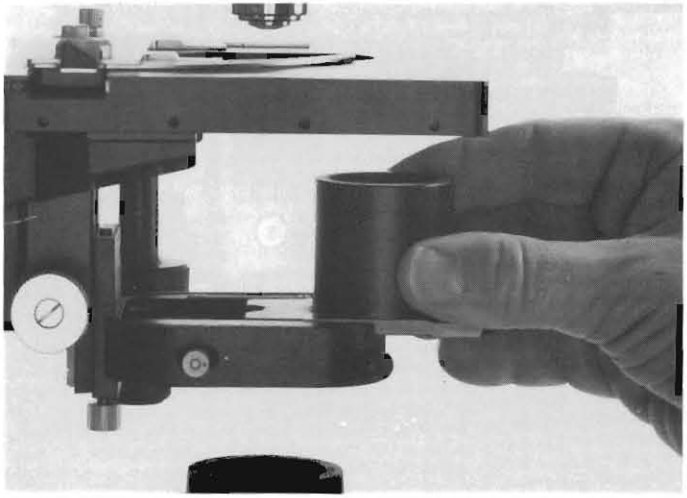


Fig. 21 Leitz LABORLUX S with I-Lambda PLOEMOPAK incident light fluorescence illuminator

1 Groundglass screen for checking lamp centration
2 Orientation marks for correct insertion of the filter changing device
3 Locking mechanism of the filter changing device
4 Filter changing device
5 I-λ PLOEMOPAK
6 Field diaphragm
7 Excitation light barrier
8 BG 38 red absorption filter
9 Light shield
10 Lamp holder for lamphousing 102 Z
11 Lamphousing 103 Z with 100 W mercury maximum-pressure lamp
12 Light trap
13 Lever for opening the tube mount

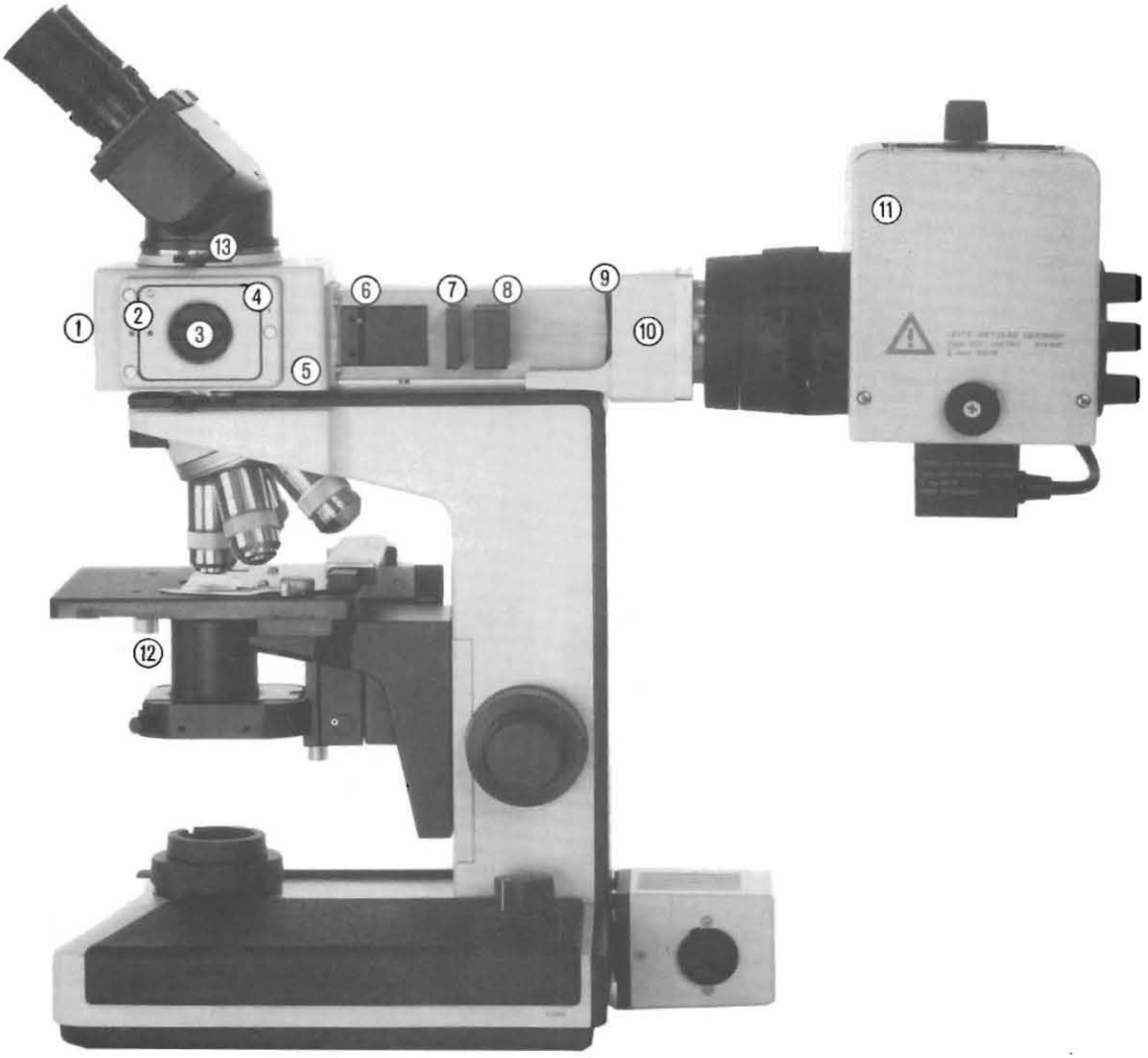

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Fig. 22
Removing the filter changing device to change the filter system

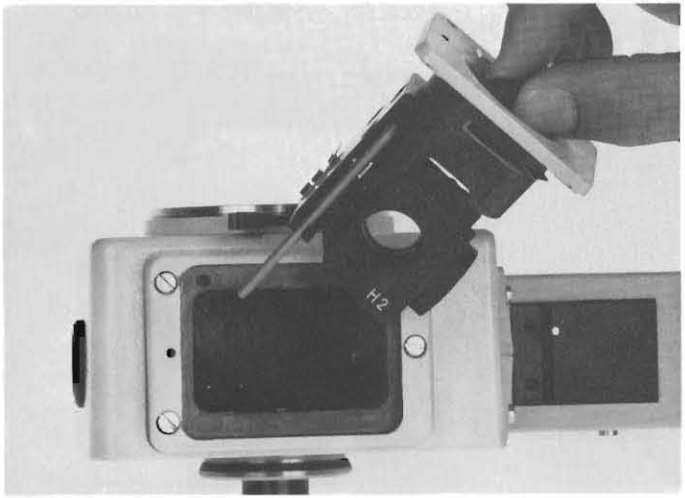


Fig. 23
Removed filter changing device with key for loosening/tightening the filter block

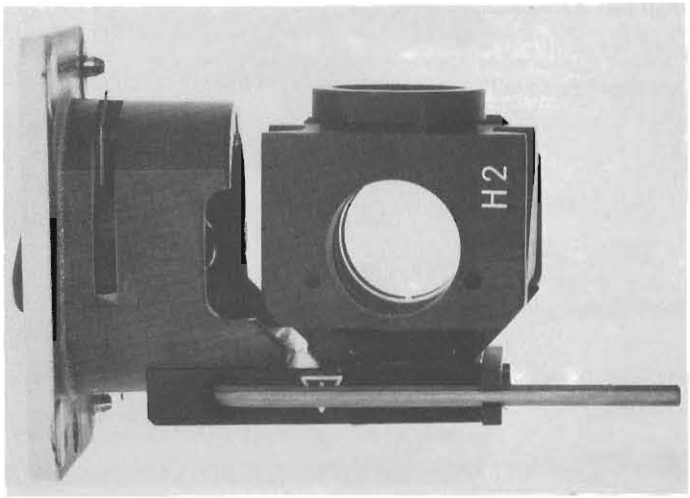


Fig. 24
Loosening/tightening the filter block
Inserting the filter block into the filter changing device. The block engraving (1) must be on the same side as the marking (2).

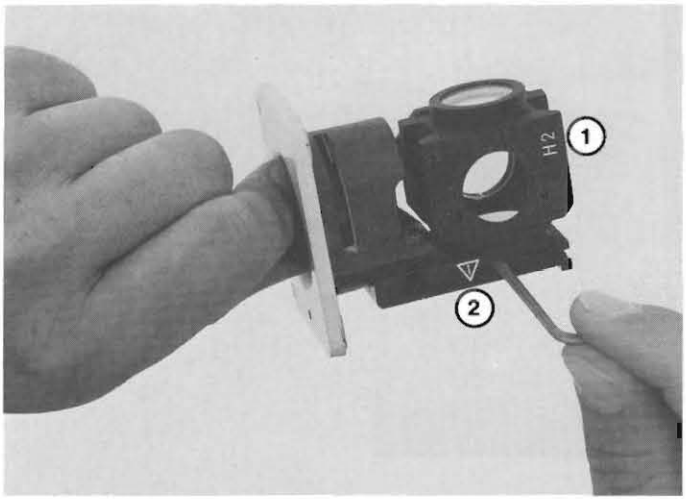
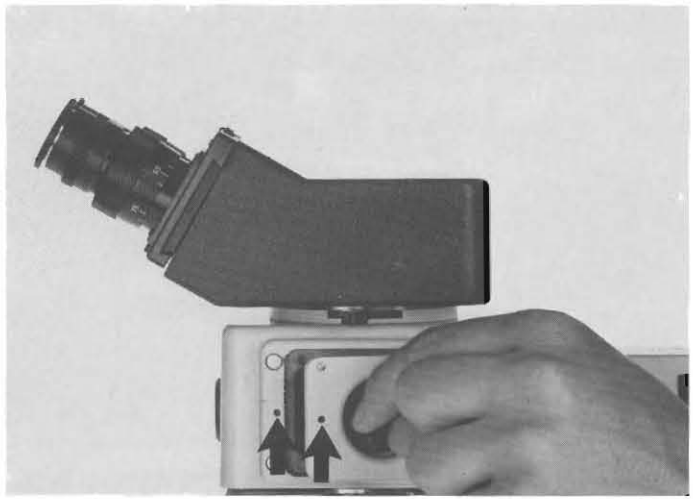


Fig. 25
When inserting the changing unit into the housing, it must be ensured that the two dots (arrows) are in line.



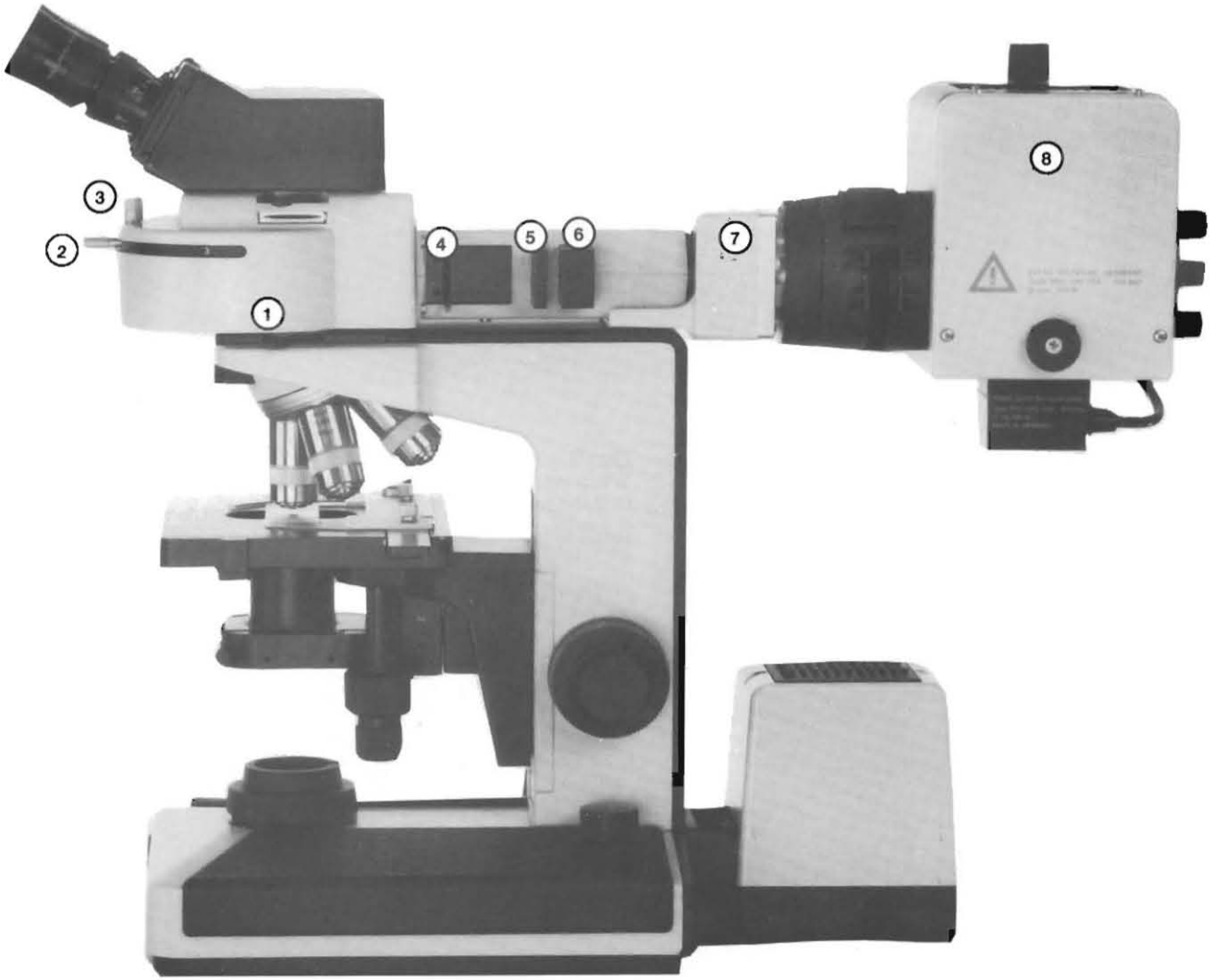

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Fig. 26
3-λ PLOEMOPAK with tube factor 1x

1 3-λ PLOEMOPAK
2 Lever for changing the filter system
3 Lever stop for the twin wavelength method
4 Field diaphragm
5 Excitation light barrier
6 BG 38 red absorption filter
7 Lamphousing mount
8 Lamphousing 102 Z with 100 W mercury maximum pressure lamp

Exchange and insertion of filter systems

Fig. 27
Opening the cover to change a filter system.
The key for loosening and tightening the filter block can be found on the inside of the cover plate.

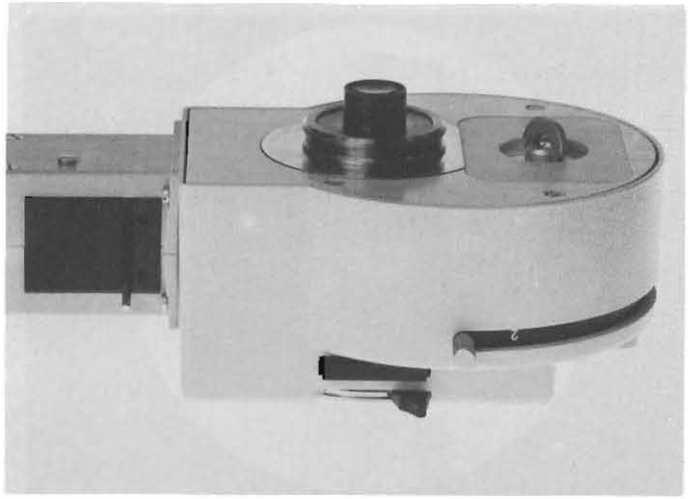
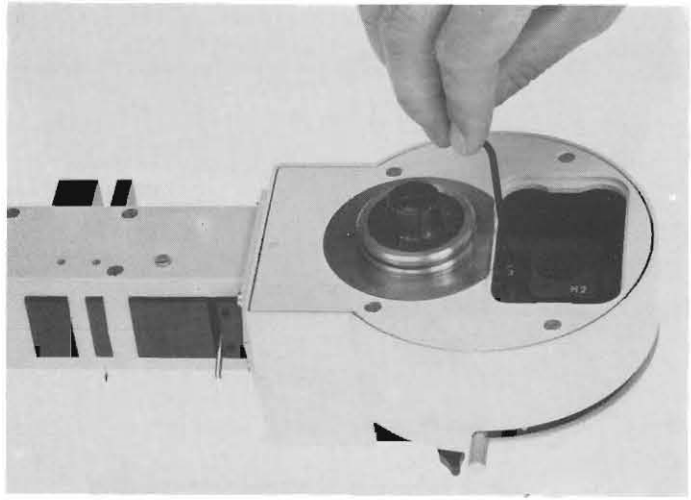


Fig.28
Loosening/tightening the filter system



Transmitted light insert

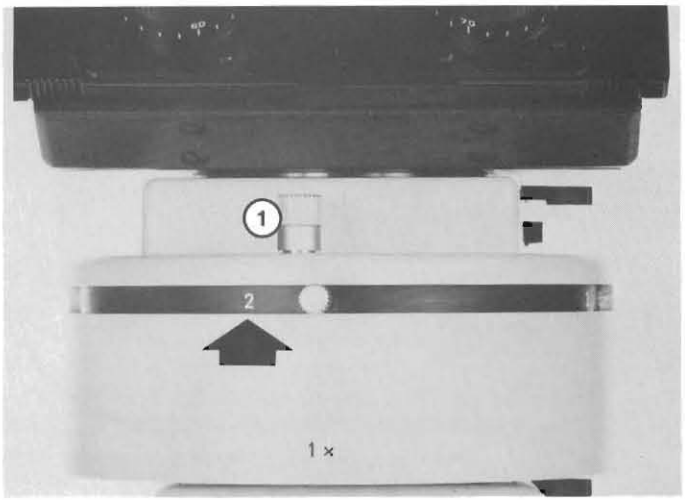
Instead of a filter block, a transmitted light insert can be used in the PLOEMOPAK for normal transmitted light microscopy. The microscope can thus be used alternately for transmitted light brightfield work and incident light fluorescence studies, without the Leitz PLOEMOPAK having to he removed from the microscope.

Twin wavelength method

This method is used for recognition of small amounts of one fluorochrome in the presence of relatively large quantities of a second. By successive excitation with two wavelengths, the specific fluorescence can be observed separately from the other. Two different components can then, for example, be recognised inside one or in separate cells.

Please refer to the instructions for the Lamphousing 103 Z (Order no. 933 534) for information on insertion, operation and centration of the mercury maximum-pressure lamp.

Fig. 29
The arrowed number indicates the filter system in effect. The stop (t) clicks into place when the block is correctly positioned. Only filter blocks 1 and 2 can now be used. For interchange between all three positions, pull the stop upwards and clamp by rotating slightly.



Filter blocks for the PLOEMOPAK incident-light illuminator

Name	Area of application	Excitation filter	Splitting mirror	Absorption filter	Order No.
A 2	Ultraviolet	BP 270 - 380	RKP 380	BP 410 - 580	513 597
A	Ultraviolet	BP 340 - 380	RKP 400	LP 430	513 596
B 2	UV + violet	BP 350 - 410	RKP 455	LP 470	513 599
D	UV + violet	BP 355 - 425	RKP 455	LP 460	513 600
E 3	Blue	BP 436/7	RKP 475	LP 490	513 601
G	UV + violet + blue	BP 350 - 460	RKP 510	LP 515	513 602
H 3	Violet + blue	BP 420 - 490	RKP 510	LP 515	513 673
I 2/3	Blue	BP 450 - 490	RKP 510	LP 515	513 604
K 3	Blue	BP 470 - 490	RKP 510	LP 515	513 674
L 3	Blue	BP 450 - 490	RKP 510	BP 525/20	513 670
M 2	Green	BP 546/14	RKP 580	LP 580	513 608
N 2	Green	BP 530 - 560	RKP 580	LP 580	513 609
N 2.1	Green	BP 515 - 560	RKP 580	LP 580	513 610

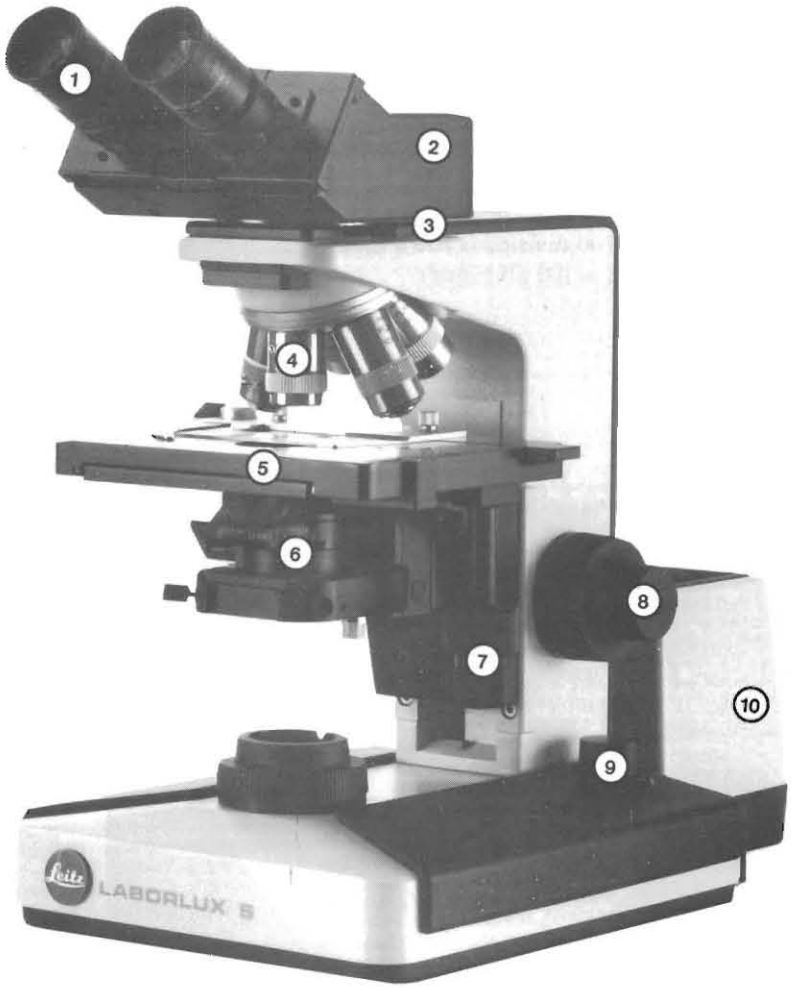


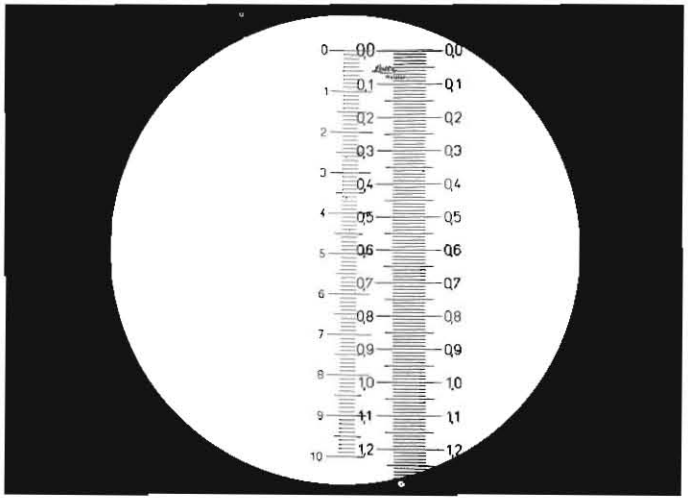
Fig. 30
1 Eyepiece
2 Binocular tube S (30°)
3 Lever to open the tube mount
4 Objective
5 Mechanical stage no. 18
6 LK condenser
7 Coaxial drive for object movement
8 Coarse and fine drive
9 Intensity regulation for the 6 V 20 W halogen lamp
10 Lamphousing 104

4 Microscopic Measuring

The measurement of microscopic objects is carried out using a measuring eyepiece (usual scale; 10 mm = 100 divisions). Before starting the measurement, the micrometer value of the objective in use must be known. The micrometer value is the distance in the specimen plane which produces an image exactly one division long on the graticule scale in the measuring eyepiece. As the optical constants of the objectives fluctuate slightly, it is recommended that the micrometer value be determined initially with the aid of a specimen micrometer.
Examples:
Evaluation of the micrometer value with a specimen micrometer (2 mm = 200 divisions) and a measuring eyepiece with graticule (10 mm = 100 divisions).

Move the micrometer until the zero lines on both it and the measuring eyepiece coincide; the micrometer value can be read off from the end of the measuring eyepiece scale.
In this example, the end of the eyepiece scale (100 divisions) coincides with 1.220 mm on the micrometer scale. 100 divisions therefore is equivalent to 1.220 mm, and 1 division = 0.01220 mm = 12.20 μm.
For low-power objectives where the micrometer scale does not cover the entire eyepiece scale, only 10 eyepiece scale divisions are measured. For example, if the tenth division corresponds to 0.36 mm on the micrometer scale, then 1 division = 0.036 mm = 36 μm.
For very precise measurements, the screw micrometer eyepiece is available; further details from brochure 513 17.

Fig. 32
Graticule scale in the eyepiece and specimen micrometer image.



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