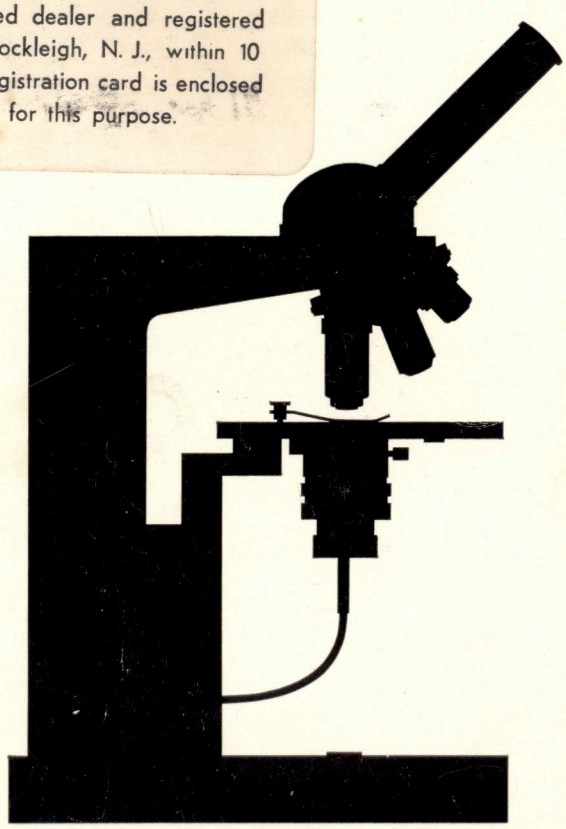
# LEITZ HM-LUX

## Microscope for the examination of transparent objects

## Instructions

Leitz instruments are guaranteed for two years against manufacturing defects when purchased through an authorized dealer and registered with E. Leitz, Inc. Rockleigh, N. J., within 10 days of receipt. A registration card is enclosed with each instrument for this purpose.



HM-5522

321.512–121 c Engl.

# LEITZ HM-LUX

## Microscope for the examination of transparent objects

## Instructions


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# 1 Technical Description

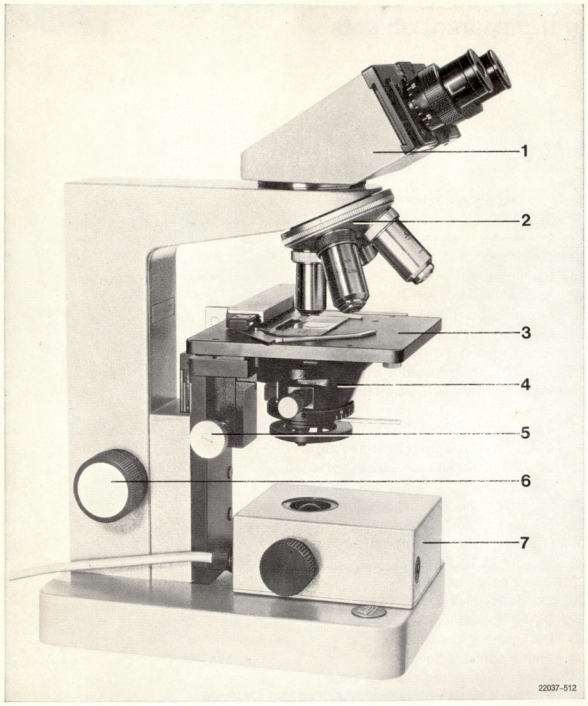



Fig. 1

HM-LUX, binocular
1 Binocular tube S
2 Revolving nosepiese with 4 objectives
3 Object stage No. 16
4 Swing-out Condenser No. 301
5 Vertical adjustment of the condenser
5 Single-knob controls for coarse and fine adjustment
7 TL illuminator



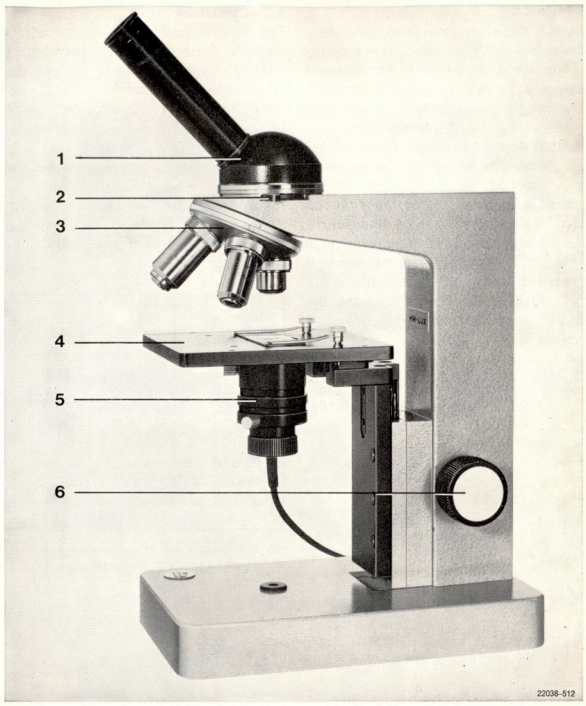



Fig. 2

HM-LUX, monocular
1 Monocular tube P
2 Tube changer
3 Revolving nosepiece (with 3 objectives)
4 Object Stage No. 24
5 HD illuminator
6 Single-knob control for coarse and fine adjustment

## 11 Stand

Object stage and revolving nosepiece are permanently mounted on the microscope stand. The tube is interchangeable and can be rotated through 360°. The single-nob control 1.6 on both sides of the stand permits rapid and reliable work in all ranges of magnification. When the rotary knob is turned in one direction the mechanism acts as coarse adjustment. When the direction of rotation is reversed the fine adjustment becomes operative, with a range of about 1/3 turn of the rotary knob. If the knob is turned beyond the slight resistance of the fine adjustment, the coarse adjustment becomes operative again.

## 12 Objectives

The optical outfit consists of achromatically corrected objectives of 4-100x primary magnification. The objectives are matched on the revolving nosepiece; after magnification change only slight refocusing with the fine adjustment is required.

Objectives of magnifications of 25x and above have a spring-loaded mount for the protection of their front lens and of the specimen. The adjustment length of the objectives (distance between flange and specimen) is 45mm.

| Reproduction ratio/ aperture | Free working distance in mm | Cover glass correction |
|---|---|---|
| 4/0.12 | 24.00 | DO |
| 10/0.25 | 6.80 | DO |
| 25/0.50 | 0.44 | D |
| 40/0.65 | 0.42 | D |
| 100/1.25 Oil | 0.10 | D |

DO = can be used with or without coverglass
D = must be used with coverglass



## 13 Condensers

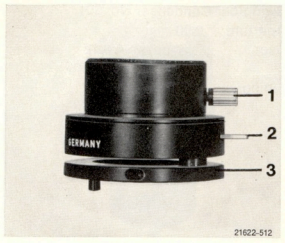



Fig. 3 Condenser No. 59

Condenser No. 59
Aperture: 0.65
Use: Objectives 4/0.12 to 40/0.65
Fitting: Sleeve mount

1 Clamping screw
2 Aperture diaphragm
3 Swing-out filter holder

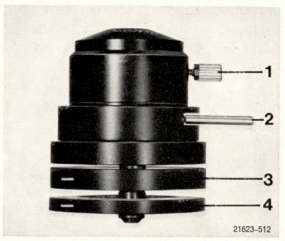



Fig. 4 Condenser No. 61

Condenser No. 61
Aperture: 1.25
Use: Objectives 4/0.12 to 100/1.25 Oil
Fitting: Sleeve mount

1 Clamping diaphragm
2 Aperture diaphragm
3 Swing-out lower lens component
4 Swing-out filter holder

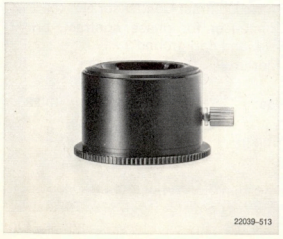



Fig. 5 Condenser No. 85

Dry Darkground Condenser No. 85
Aperture: 0.80
Use: Objectives 10/0.25 to 40/0.65
Fitting: Sleeve mount

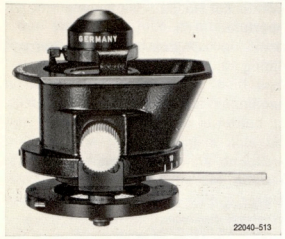



Fig. 6 Swing-out Condenser No. 301

Swing-out Condenser No. 301
Aperture: 0.90
Use: Objectives 4/0.12 to 100/1.25 Oil
Fitting: Dovetail changer

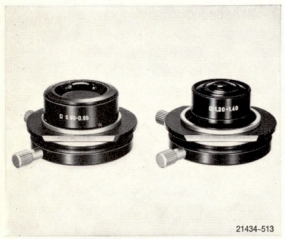



Fig.7 Darkground Condensers No. 88 and 86

Dry Darkground Condenser No. 88
Aperture: 0.80
Use: Objectives 10/0.25 to 40/0.65
Fitting: Dovetail changer

Immersion Darkground Condenser No. 86
Aperture: 1.20
Use: Objective 100/1.25 Oil
Fitting: Dovetail changer

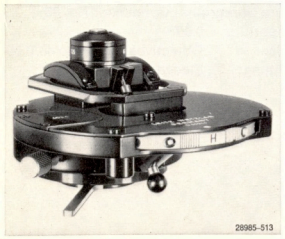



Fig. 8 Phase Contrast Condenser No. 402 a

Phase Contrast Condenser No. 402 a
Condenser for phase contrast, brightfield, and darkground
Aperture: 0.90 brightfield
0.80 darkground
Use: Objectives PHACO 10/0.25 to PHACO 100/1.25
Fitting: Dovetail changer

Directions for the use of the phase contrast condenser are contained in Instructions No. 513-84 Phase Contrast Condenser according to Zernike.



## 14 Illuminators




Fig. 9 HD-illuminator

6v 200 mA brightfield and darkground illuminator.
Simplified condenser with built-in illuminator for brightfield and darkground.
Use for brightfield:
Objectives 4/0.12 to 100/1.25 Oil
Use for darkground:
Objectives 10/0.25 to 40/0.65
Fitting:
Sleeve mount
In conjunction with a separate lamp housing and light conductor this condenser can be adapted for transmitted-light fluorescence.

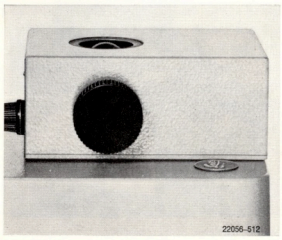



Fig. 10 TL illuminator

6v 10W TL illuminator with built-in continuously regulating transformer.




Fig. 11 Micro-dia lamp attachment

220v (110v) 15W micro-dia lamp attachment.
Direct mains connection (without transformer).

Concave and plane mirror for daylight or independent microscope lamp (not shown).

## 2 Assembly

### 21 Inserting the tube

Push the tube changing lever to the rear and drop the tube into the bayonet changer from above; the tube can be rotated through 360°. It is clamped by a slight pressure on the lever to the front.




Fig. 12 Inserting the tube

### 22 Inserting the objectives

Lower the object stage with the coarse adjustment and screw the objectives into the apertures in the revolving nosepiece.

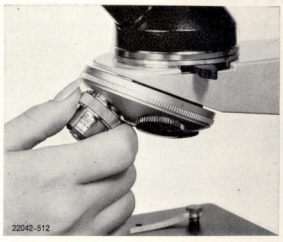



Fig. 13 Screwing in the objectives

### 23 Attaching the TL lamp attachment

Unscrew the knurled screw on the underside of the TL illuminator. Insert the pin into the bush in the foot of the stand and fix it with the knurled screw (from underneath). Check mains voltage, plug into the mains. The lamp is ready for operation.

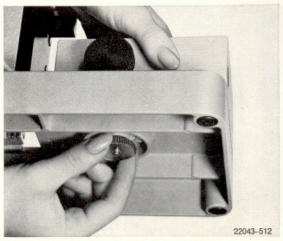



Fig. 14 Fixing the TL illumnator



### 24 Attaching the micro-dia lamp attachment

Unscrew the knurled screw on the underside of the illuminator. Insert the pin into the bush in the foot of the stand and fix it with the knurled screw (from underneath) (see also Fig. 14). Check mains voltage, plug into the mains. The lamp is ready for operation. A turn of the switch in the direction of the arrow switches it on and off.

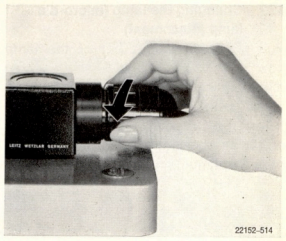



Fig. 15 Switching on the micro-dia lamp attachment

### 25 Inserting the HD illuminator

Unscrew the fixing screw and, having raised the object stage, push the illuminator into the condenser sleeve from below. Replace the fixing screw.
Both illluminators are connected to the transformer Code No. 500183.

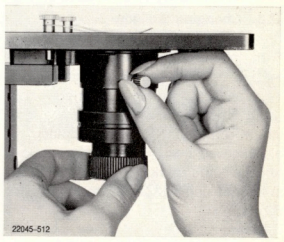



Fig. 16 Inserting the HD illuminator

### 26 Changing the TL lamp

Pull the lamp mount out of the lamp housing. Lightly push the lamp into the bayonet socket and unlock it. Insert new lamp and lock it. Remove fingermarks with a piece of clean cloth. Push the lamp mount into the housing as far as it will go and establish optimum illumination by rotating it (to obtain optimum illumination, the position of the mount may differ from lamp to lamp. It need not be pushed in as far as possible. The optimum position for illumination may be a little before maximum insertion owing to the tolerance of the lamp).




Fig. 17 Changing the TL lamp

## 27 Changing the lamp (micro-dia lamp attachment)

Pull the lamp mount out of the lamp housing. Unscrew the old lamp from the mount - screw a new one in. Remove fingermarks with a piece of clean cloth. Insert the lamp mount in the housing as far as possible. Rotate the mount to obtain optimum illumination.




Fig. 18 Changing the micro-dia lamp

## 28 Changing the lamp (HD illuminator)

Turn the lamp mount to the left and push it in as far as it will go (bright-field setting). Release knurled screw (23.4) (about 5 turns) and pull the lamp mount out of the housing. Replace the old lamp by a new one (plug-in socket), remove fingermarks, replace the mount in the housing and fix it with the knurled screw.

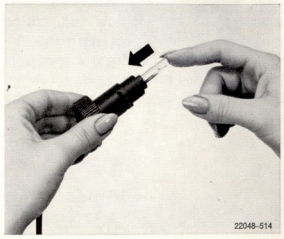



Fig. 19 Changing the HD lamp



## 29 Attaching the Object Guide No. 22

Remove both stage clips from the object stage and push the object guide on to the stage from the side. Screw it in position with the two knurled screws. The object guide for left-hand operation is mounted accordingly.

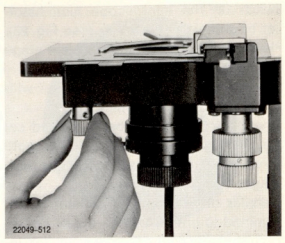



Fig. 20 Attaching the Object Stage No. 22

## 210 Inserting (or changing) the condenser

On the HM-LUX with fixed condenser sleeve mounts the condenser No. 59, 61, and 85 can be used. Attachment: see HD-illuminator Fig. 16.

For the HM-LUX with condenser dovetail changer the condensers No. 301, 86, 88, and 402 a are available.

For changing the condenser raise the object stage and lower the dovetail changer with rack and pinion (21.1). Insert the condenser in the dovetail guide as far as it will go and raise it with the rack and pinion.

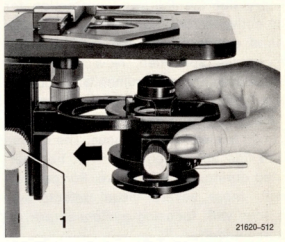



Fig. 21 Inserting the Swing-out Condenser No. 301

# 3 Preparing the HM-LUX for operation

Switch on the microscope illuminator. Set brightfield illumination (see Fig. 23). Place the specimen on the object stage and turn an objective into the beam.
Focus the microscope image with coarse and fine adjustment.
When the binocular tube S is used set the interpuillary distance with both hands (see Fig. 22) so that the two part-images become coincident.
Transfer the interpupillary distance determined to both eyepiece tubes. For an interpupillary distance of 65mm, for instance, set both eyepiece tubes at index 65.
Carry out the following correction for defective vision: look through the right-hand eyepiece with the right eye and focus the specimen. Now look at the same area of the specimen with your left eye and rotate the left-hand eyepiece tube until the same area of the specimen is also in sharp focus. The coarse and fine adjustment must not be operated during this procedure. For persons with more severe visual defects eyepieces with focusing eyelenses are recommended.

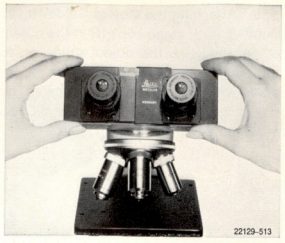


Fig. 22 Adjusting the interpupillary distance

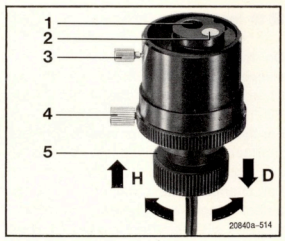


Fig. 23 HD illuminator
1 Darkground illumination
2 Brightfield illumination
3 Fixing screw for condenser
4 Fixing screw for lamp mount
5 Lamp mount
H Brightfield position
D Darkground position

### 31 HD-illuminator (darkground)

Push the lamp mount (23.5) downwards according to Fig. 23 D and turn it to the right. Objectives from 10/0.25 to 40/0.65 can be used.
Turn the HD-illuminator up as far as it will go with the large knurled ring. Set optimum darkground illumination by slightly turning it back.

### 311 HD-illuminator (brightfield)

Turn the lamp mount (23.5) to the left according to Fig. 23 H and push it upwards.
Lower the HD-illuminator with the large knurled ring until the brightfield illumination covers about 2/3 of the rear focal plane of the objective.



### 32 Brightfield condensers

When the brightfield condensers No. 59, 61, and 301 are used, close the aperture diaphragm so that when you look into the eyepiece tube (with the eyepiece removed) about 2/3 of the rear focal plane of the objective is illuminated (Fig. 24). Replace the eyepiece. This setting ensures optimum resolution and optimum contrast. If the aperture diaphragm is closed further, contrast will be increased, but resolution reduced. If a different magnification is chosen, proceed as described above.

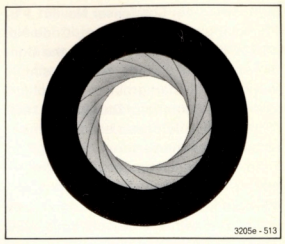


Fig. 24 Rear focal plane of the objective with the eyepiece removed. The aperture diaphragm is 1/3 closed.

### 321 Condenser No. 59

For use with objectives 4/0.12 to 40/0.65 (not for oil immersion). When the objective 4/0.12 is turned in, a groundglass screen is inserted in the filter holder (3.3) for uniform illumination.

### 322 Condenser No. 61

For use with the objectives 4/0.12 to 100/1.25. Turn the bottom part (4.3) in for the 4/0.12 objective only, for higher magnifications always leave it outside the beam.
Use the 100/1.25 Oil objective always with immersion oil, i.e. a drop of immersion oil must joint the coverglass of the section with the front lens of the objective.
Image quality is further improved if the condenser, too, is immersed, i.e. a connection established between the top lens of the condenser and the underside of the microscope slide by means of immersion oil.

### 323 Swing-out Condenser No. 301

A special push-in diaphragm, Code No. 513324, has been designed for the Condenser No. 301, which offers a simple possibility of darkground and phase contrast illumination. Darkground setting, however, is possible only with objectives up to an aperture of 0.65.
If the same insert is used as for darkground, but in an inverted position, phase contrast observations can also be carried out with the objectives PHACO 25/0.50 and PHACO 40/0.65.

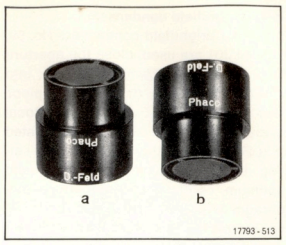



Fig. 25 Push-in diaphragm
a For darkground and
b for phase contrast

**Darkground**

**Fully** open the aperture diaphragm and **turn in** the condenser top. Insert the push-in diaphragm into the condenser from below as far as it will go; the engraved word "D-FELD" (25a) must be right way up.

**Phase contrast**

**Fully** open the aperture diaphragm. **Swing-out** the condenser top. Insert the push-in diaphragm into the condenser from below so that the engraved word "PHACO" (25b) is right way up.
Use only phase contrast objectives
PHACO 25/0.40 and
PHACO 40/0.65.



### 33 Darkground condensers

No. 85 (sleeve mount)
No. 88 (dovetail changer)
No. 86 (dovetail changer)
Insert the condenser and raise it to its topmost position. Focus with 10/0.25 objetive. Vertically adjust the condenser until the image field is uniformly illuminated.
With condensers No. 86 and 88 centre, if necessary, the illuminated field with the 2 centring screws. Further directions will be found in Instructions "Darkground Condensers" No. 513-31.

### 34 Phase contrast device

Special objectives are required for observation in phase contrast. Screw them into the revolving nosepiece.

### 341 Phase contrast condenser 402a

Push the condenser into the dovetail changer and centre and adjust it according to Instructions No. 513-84.
In addition to phase contrast, the condenser can also be used for brightfield and darkground observation.

### 342 Phase contrast objectives PHACO 170/0.17/45mm

| Engraving: Reproduction ratio/aperture | Free working distance in mm | Cover glass correction |
|---|---|---|
| 10/0.25 PHACO 1 | 6.80 | DO |
| 25/0.50 PHACO 2 | 0.44 | D |
| 40/0.65 PHACO 2 | 0.42 | D |
| 100/1.25 PHACO 3 Oil | 0.11 | D |

DO = can be used with or without coverglass
D = must be used with coverglass

### 35 Magnification change

Magnification is changed simply by rotation of the revolving nosepiece. Only minor refocusing with the fine adjustment is required. If necessary readjust the condenser.

### 36 Hints for use of immersion objectives

Immersion objectives are identified by their engraving: Oil and black ring = oil immersion, W and white ring = water immersion. The front lens of immersion objectives is fitted in a spring-loaded mount for the protection of the specimen and the lens.

To focus an immersion objective, only a single drop of immersion oil should be applied to the specimen, to avoid the risk of air bubbles. The specimen is moved towards the objective, until this is immersed in the oil. Finally, the specimen is focused in the microscope with the fine adjustment.

**Air bubbles in the column of oil** between the specimen and the front lens adversely affect the performance of the system. They can be seen in the tube after removal of the eyepiece as small luminous spheres or dots. Usually they can be pushed out of the object field by means of a swivelling movement of the revolving nosepiece. Failing this, it is best to wipe the oil off the objective and the object with a soft piece of cloth and to apply fresh oil.

After use the front lenses of immersion objectives must be cleaned immediately. The oil is removed with blotting paper or a piece of lint, and the front lens wiped clean with a piece of soft cloth. A little light petrol should be used.

To obtain optimum sharpness and brilliance with oil immersion objectives, it is essential to use LEITZ immersion oil, since the objectives have been computed for it. Especially with objectives of relatively long working distance (e.g. Pl Apo Oil 100/1.32) care must be taken, because of possible changes in the composition of the oil, to use only oil supplied within the last two years.



### 37 Polarized light

With the aid of the filter polarizing device (polarizer and analyser) it is possible to carry out orienting investigations in polarized light.

Insert the polarizer (26.1) in the filter holder of the condenser. Remove the monocular tube P from the stand.

Screw up the fixing disc (27.3) of the assembly tube (27.2) to the locating pin (27.1). Screw the assembly tube (27.2) into the head of the stand as far as it will go and turn it back until the locating pin (27.1) is lined up in the east-west direction to the observer. (See Fig. 27).

Fix the assembly tube (27.2) with fixing disc (27.3).

Place the analyser (27.5) in position, and, with slight pressure, place the locating notch (27.6) on the pin (27.1).

Replace and secure the monocular tube P. The extinction position is obtained by rotation of the polarizer (26.1).

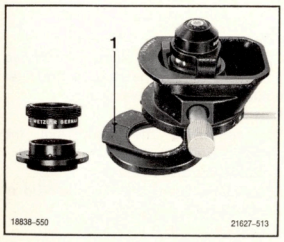



Fig. 26 Filter polarizing device
1 Polarizer

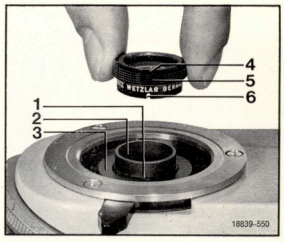



Fig. 27 Placing the analyser in position
1 Locating pin
2 Assembly tube
3 Fixing disc
4 White indicator of the polarizing setting
5 Analyser
6 Locating notch

## 38 Microscopic measurement

Linear measurements of the objects are carried out with the NF 10 x M micrometer eyepiece with graticule 10mm = 100 intervals and the 2mm = 200 intervals stage micrometer.

Before the measurement is begun the micrometer value of the objective used must be known.

To do this, place the stage micrometer on the object stage and focus it with the objective of the desired magnification. Make the 0 lines of stage micrometer and micrometer eyepiece coincide (see Fig. 28). The micrometer value is read off the end of the scale of the micrometer eyepiece.

Example:

If 1.22mm of the stage micrometer coincide with 100 intervals of the eyepiece, the micrometer value will be 1.22 : 100 = 0.0122mm = 12.2µm.

Replace the stage micrometer by the specimen and measure the length of the latter.

Continuation of example:

The object extends across 20 intervals of the micrometer eyepiece. Its length will then be 20 x 12.2 = 244µm = 0.244mm.

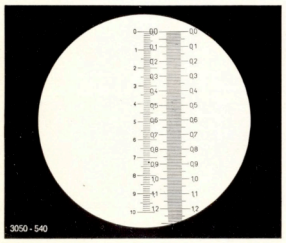



Fig. 28 Graduation of the graticule in the eyepiece and image of the stage micrometer

**Filters**

Other filters than the already mentioned polarizer can be inserted in the filter holder of the condenser:

**Blue filter 512 201**

For converting the light from the tungsten filament lamp into daylight

**Groundglass disc 512 202**

For uniform illumination of the field of view with critical objects.

**Green filter 512 203**

For contrast increase of weakly stained objects and for photomicrography on black- and white film.



## 39 Fluorescence

Push the HD-fluorescence illuminator into the sleeve, screw the fixing screw in (see Fig. 16) and obtain darkground setting.

Connect the light conductor with the coupling to the pillar stand illuminator (29.3). Switch on the mercury lamp with the power unit.

Insert the exciting filter in the filter slot (29.1) of the Lamp Housing 100 Z and place the suppression filter on the eyelens of the eyepieces.

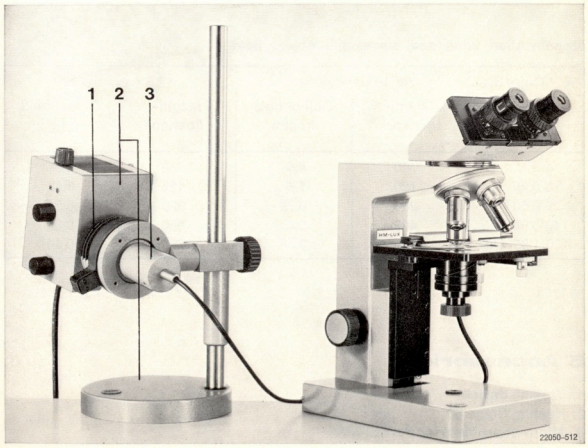



Fig. 29 HM-LUX for transmitted-light fluorescence
1 Filter slot
2 Illuminator on pillar stand with Lamp Housing 100 Z and 50 W mercury lamp
3 Light conductor coupling

# 4 Care of the microscope

The microscope, when not in use, should always be covered with the dust cover. From time to time the stand should be cleaned with a soft rag soaked in petrol. Bright patches on the object stage can be removed by treatment with liquid paraffin or acid-free vaseline.

Contact of optical equipment and stand with acids or other corrosive chemicals must definitely be avoided. The optical components of the microscope should be kept clean.

Dust on glass surfaces is removed with a fine, soft, dry sable brush. Blow lightly across the glass surface while doing so. For resistant dirt use a piece of clean linen or soft chamois leather. Remove dirt resisting even this treatment with petrol or methylated spirit.

Objectives must not be dismantled for cleaning. If internal damage is evident, return the objective to the factory for repair.

Correct treatment preserves the value of the microscope. For checking or repairing a damaged instrument, please contact your local LEITZ agent or the main factory at Wetzlar.

**Magnification table and surveyable object field**

| Objective | NF 10x eyepiece | | 12.5x eyepiece | |
|---|---|---|---|---|
| | Magnification | Object field in mm | Magnification | Object field in mm |
| 4/0.12 | 40 | 4.5 | 50 | 3.5 |
| 10/0.25 | 100 | 1.8 | 125 | 1.4 |
| 25/0.50 | 250 | 0.72 | 320 | 0.56 |
| 40/0.65 | 400 | 0.45 | 500 | 0.35 |
| 100/1.25 Oil | 1000 | 0.18 | 1250 | 0.14 |

# 5 Accessories

1. Tracing device
2. Heating Stage 80
3. Micro-attachment for the LEICA®
4. PLOEMOPAK® 2.3 Fluorescence Vertical illuminator

See special instructions for these accessories.

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