Leitz
WETZLAR

INSTRUCTIONS

SM MICROSCOPE

This booklet contains the directions necessary for setting up and operating the SM microscope correctly. While the user is expected to have a general knowledge of microscopy, important optical relationships are explained in sufficient detail to ensure a thorough understanding of the special design features of this microscope.

ERNST LEITZ GMBH WETZLAR GERMANY

512-38 e/Engl.

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1 knurled ring for focusing the eyepiece for differential visual acuity

2 lever for setting the interpupillary distance

3 tube locking lever

4 nosepiece threads with objectives in position. The threads are numbered. The objective/eyepiece table enclosed with each instrument indicates the nosepiece threads with which the individual objectives are matched

5 spring-loaded front mount of the medium- and high-power objectives to protect front lens and specimen

6 object holder for object slides of 100 mm maximum length; it can be removed so that a free space is available on the stage for large specimens. The reading of the two scales of the mechanical stage is independant of the setting of the object holder

7 centring screws of the swing-out condenser No. 601

8 aperture diaphragm of the condenser

9 dust-glass of the lamp attachment

10 6 v 15 W lamp attachment

11 single knop control for focusing the microscopical image

12 Coaxial control for the mechanical stage movements

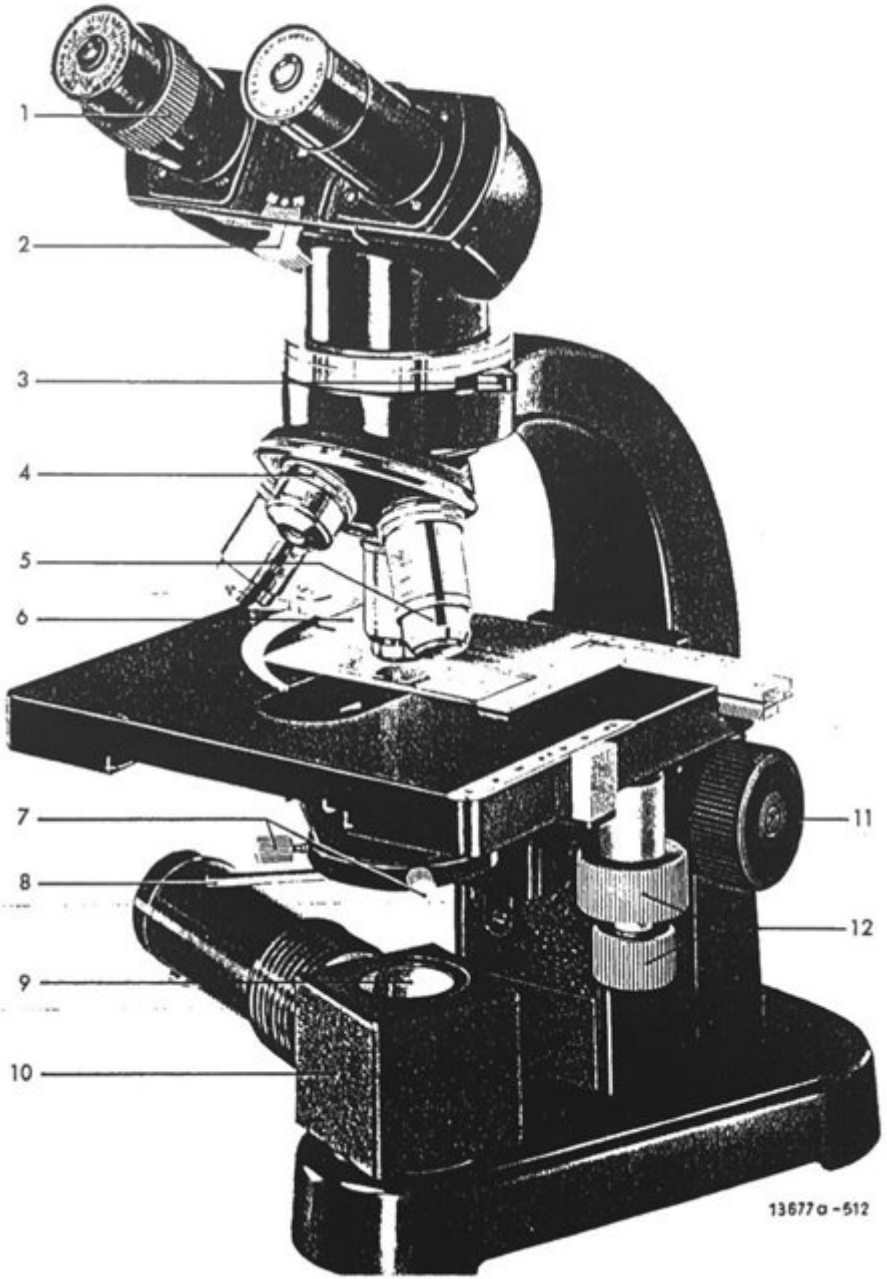

Fig. 1
SM microscope with mechanical stage No. 48, binocular tube S, and 6 v 15 W lamp attachment

Shipment and unpacking of the microscope

The microscope tube and mirror or lamp attachment are packed separately.
All parts are housed in the carrying case. During unpacking, examine the packing material carefully for small parts and immediately check the contents with the packing note. Place the parts on a clean table ready for assembly.
All mechanical and optical parts are thoroughly cleaned before despatch, and should therefore be carefully protected against dust and dirt; the glass surfaces of objectives and eyepieces should never be touched. Any finger marks on such surfaces must at once be removed with a soft piece of chamois leather or of well-washed linen; even minute, invisible traces of finger moisture may rapidly attack the surface of high-quality glass.

Work room and work place

The work room must meet certain basic requirements; it should, as far as possible, be free from dust, and of oil- and chemical fumes liable to attack the optical and mechanical parts of the microscope. Large temperature variations are undesirable. A mains socket should be available near the workplace. A 5 amp. fuse will be adequate.

Assembling the microscope

1. Place the microscope stand on a table and remove the piece of wood below the object stage support inserted for the protection of the fine adjustment during transport.
2. When the microscope is dispatched in its carrying case, the objectives are left on the revolving nosepiece in their appropriate threads (see the objective/eyepiece (magnification) table included with the microscope). This arrangement ensures their parfocality. If the objectives had for any reason to be removed from the nosepiece care should be taken to return them to their appropriate thread.
3. The tube (monocular or binocular) is inserted as follows: — Open the locking lugs with the lever 3, insert the tube in the holder, and release lever 3. At this stage the tube can be fully rotated on the microscope. If, however, the lever 3 is pressed firmly opposite its opening direction the tube remains locked in a wanted position.
4. The condenser is already in its working position in its dovetail- or sleeve mount below the object stage.
5. The objective/eyepiece table mentioned under 2) also lists the best objective/eyepiece combinations. For binocular observation obviously only paired objectives of the same magnification and type must be used.
6. One of the various lamp attachments can be inserted in the foot of the microscope instead of the microscope mirror.

Tubes

The S tube is used for binocular observation. It has a lever for setting the interpupillary distance; where this is not known, this lever (2/2) is adjusted during binocular observation until a single, circular field of view appears. Further-more, the left-hand eyepiece tube is provided with an adjustment for compensating different acuity of the user's eyes: — focus the specimen with the right eye (right eyepiece). Observe with the left eye (left eyepiece), rotating the knurled collar (2/1) of the eyepiece tube until the image appears sharp also to the left eye.

Revolving nosepiece

The revolving nosepiece has threads for four objectives. After removal of the objectives for any reason, these must be replaced in their proper order (objective-eyepiece table). The magnification is changed by rotating the revolving nosepiece.

Technical details

The various structural elements of the SM are described in detail in our list 512-37. Information essential for the operation of the instrument is given below.

Fig. 2
Inserting the tube
1 knurled ring for compensating differential visual acuity
2 lever for setting the interpupillary distance
3 tube locking lever

Brightfield condensers for transmitted light

Two sleeve-mounted condensers are available for the simple version of the SM.

The single-lens condenser No. 65, N. A. 0.65 has an aperture diaphragm and a swing-out filter holder, and is designed for work with dry systems.

The two-lens condenser No. 66, N. A. 1.20, also has an aperture diaphragm and a swing-out filter holder. It is used for brightfield work with both dry and oil immersion objectives.

The following points should be observed for the interchange of these condensers: —

Release knurled screw (3/14). Pull condenser No. 65 downwards out of the sleeve mount. Before inserting condenser No. 66, unscrew its knurled srew (5/19); push the condenser fully into the sleeve; after orientating it so that the threaded bush for the knurled screw is visible in the guide slot replace the knurled screw (5/19).

Two condensers are available for the laboratory version of the SM: —

The aspherical swing-out condenser No. 601, N. A. 0.90, consisting of the bottom part No. 600 with aperture diaphragm and condenser lens, and the swing-out condenser top No. 001. This condenser is suitable for all bright-field work with dry and immersion objectives, except when the full aperture of the immersion objective must be illuminated. It can also be used for fluorescence investigations.

The condenser No. 72r, N. A. 1.40 also has an aperture diaphragm and a swing-out filter holder. Due to its large aperture it is used mainly in fluorescence microscopy, but also when oil immersion objectives have to be fully illuminated.

These condensers are readily interchanged in their dovetail mount.

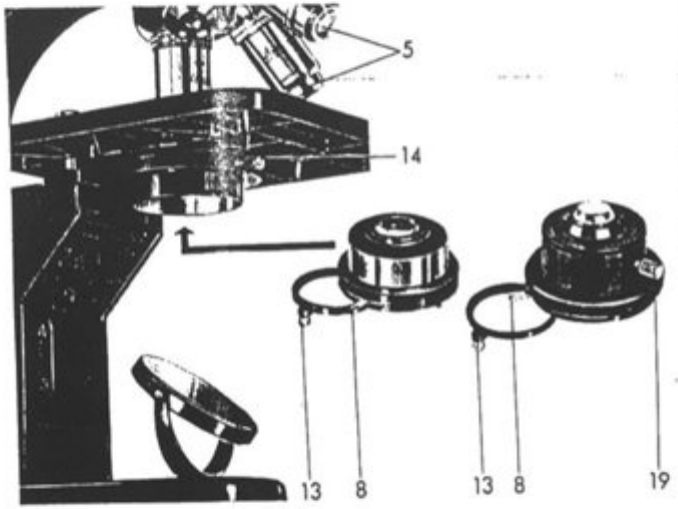

Fig. 3
Sleeve changer for condensers with sleeve mount
5 spring loaded front lens mount of objectives
14 fixing screw for the condenser (this screw has been omitted in new models)

Fig. 4
Condenser No. 65
8 Aperture diaphragm
13 filter holder

Fig. 5
Condenser No. 66
8 aperture diaphragm
13 filter holder
19 knurled screw

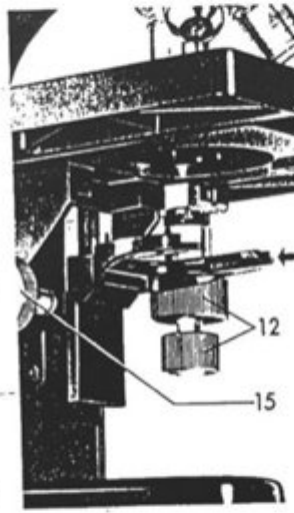

Fig. 6
Dovetail changer for condensers with dovetail mount
5 spring loaded front lens mount of objectives
12 Coaxial controls for the mechanical stage movements
15 knurled knob for the vertical adjustment of the condenser

Fig. 7
Swing-out condenser No. 601
7 centring screws
8 aperture diaphragm
16 knob for swinging out the condenser top

Fig. 8
Condenser No. 72r
7 centring screws
8 aperture diaphragm

Objectives

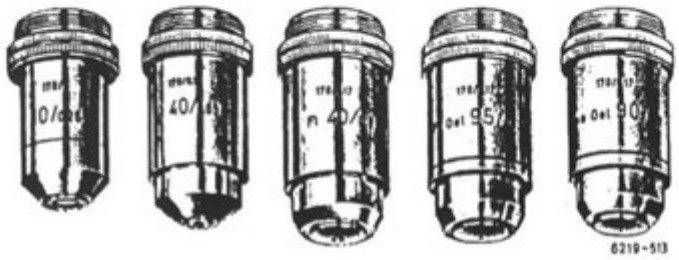

Fig. 9 Various objectives

In addition to our firm's emblem, and, in the case of oil immersion and high-power dry objectives, the serial number, our microscope objectives are engraved with a number of data briefly described below: —

170 indicates the mechanical tube length for which the objective has been computed. This is the distance in mm from the shoulder of the objective to the rim of the tube. This distance cannot be maintained with our inclined binocular tubes. Nevertheless, the objectives are still used under optimum conditions here, since the tube lens transfers the image to the new intermediate image plane without loss of quality. The magnification is thereby increased by the factor 1.25, which is engraved on the tube. It must be included in the calculation of the final magnification.

0.17 denotes the thickness of the coverglass protecting the specimen. Most LEITZ objectives are computed for this thickness. Objectives suitable for use with and without coverglass have a dash-instead of 0.17 engraved on their mount, and those which must be used without coverglass, 0.

Dry systems of large apertures (above 0.90) are supplied in correction mounts which by turning a knurled ring can be set on coverglass thicknesses ranging from 0.12 to 0.22.

40 is the simplified expression of the reproduction scale of the objective (40:1). In the objective table the term "reproduction scale" is replaced by "magnification".

0.65 is the numerical aperture of the objective.

In the case of Fluorite systems and Apochromats, the correction is also stated on the mount. These symbols reappear in the table. Immersion objectives bear the additional term "öl" and a black ring on their mounts. Objectives with iris diaphragms are denoted "Iris". Achromats have no special sign of distinction.

Objectives for transmitted-light investigations in bright- and darkfield
Tube length 170 mm

Designation of objectives	magnification/aperture	Focal length mm	Free-working distanc mm	Cover glass correction[1]	Type of eyepiece[2]
Achromatic dry systems	2,5/0,17	56,8	13,6	D O	P
	3,2/0,12	39,8	35	D O	H
	3,5/0,10	31,6	23	D O	H
	6/0,18	23,1	17,5	D O	H
	10/0,25	16,3	5,7	D O	H
	25/0,50	7,1	0,92	D	P
	40/0,55	4,5	0,67	D	P
	63/0,85	2,9	0,29	D I	P
	Iris 63/0,85	2,9	0,29	D	P
Achromatic immersion objectives W=water-immersion objectives	Öl + W 22/0,65	8,1	0,32	D O	P
	W 90/1,20	2,1	0,09	D	P
	Öl 100/1,30	1,9	0,13	D[3]	P
	Iris Öl 100/1,30 - 1,10	1,9	0,13	D	P
Flourite dry systems	Fl 40/0,85	4,3	0,38	D I	P
	Fl 70/0,90	2,6	0,26	D I	P
Fluorite oil immersion objectives	Fl Öl 54/0,95	3,4	0,22	D O	P
	Fl Öl 70/1,30	2,5	0,20	D	P
	Fl Öl 95/1,32	2,0	0,15	D[3]	P
	Iris Fl Öl 95/1,32 - 1,10	2,0	0,15	D	P
Apochromatic dry systems	Apo 12,5/0,30	13,0	2,5	D O	P
	Apo 25/0,65	7,3	0,86	D	P
	Apo 40/0,95	4,5	0,12	D I[3]	P
	Apo 63/0,95	3,0	0,12	D I[3]	P
Apochromatic oil immersion objectives	Apo Öl 90/1,32	2,0	0,12	D	P
	Apo Öl 90/1,40	2,0	0,06	D	P

All objectives from 3.5/0.10 are parfocal on the nosepiece.

[1] D: with coverglass D = 0.17 (coverglass thickness should be observed to within ± 0.05 mm)
O: without coverglass, DO: can be used with or without coverglass
D: coverglass thickness 0.17 mm should be observed accurately to within ± 0.01 mm, or should be accurately set with the correction mount where it varies from this value.

[2] These objectives have a correction mount with automatic sharpness compensation. Its adjustment has hardly any effect on image sharpness. Ideal method of focusing when the thickness of the coverglass is unknown.

[3] H = use Huygens eyepiece
P = use PERIPLAN® or PERIPLAN widefield eyepieces.

[4] These oil immersion objectives may also be used for uncovered subjects (smear preparations without coverglass); the negligible reduction of image quality can be ignored.

Light sources

The microscope mirror for daylight or separate light sources has a plane and a concave surface. The latter (aperture 0.35) is used preferably without condenser for small light sources, or low-power objectives, the plane surface together with a condenser for large light sources, or with high-power objectives, or with separate microscope lamps with collector lens. Artificial light sources should be set up approximately 25 cm (10") in front of the microscope. The concave mirror must be used to eliminate disturbing features of natural light sources, such as window frames, between light-source (sky) and microscope.

The 220 v 15 W micro-dia lamp attachment has been designed for direct mains connection. Its illumination is bright enough even for bright field oil immersion work. The lamp is attached to the foot of the microscope by means of a bayonet lock, ensuring a precise fit in any position. An on/off switch is provided on the lamp socket.

In order to replace the lamp, it is withdrawn with its socket from the sleeve mount (see Fig. 10) and unscrewed. The new lamp is screwed in, and inserted fully into the sleeve mount with its socket.

In order to replace the lamp the centring socket can be removed from the sleeve mount (see Fig. 11), when the bulb can be taken out of its socket by a short anticlockwise turn. The new lamp is inserted in the reverse sequence. The centration of the beam path should be checked each time a lamp has been changed (see p. 8).

Fig. 10
Micro-dia lamp attachment
9 dust-glass (blue)

Fig. 11
6 v 15 W lamp attachment
9 dust-glass
17 lamp socket clamping screw
18 lamp centring screw

6 v 15 W lamp attachment. This lamp can be centred. It is attached to the stand by means of a bayonet lock which ensures a precise fit in any position, and can be connected to the mains only by means of one of the following transformers available (a. c.).

REROW	with 4 tappings for 3, 5, 6, 8 v
RESEV	lamp current adjustable up to 2.8 amp.
RETAV	as RESEV, with ammeter, red warning line at 2.8 amp.

Ascertain first that type of current and mains voltage are correct. All three transformers can be adjusted for mains voltages from 110 to 240 v. If the user's mains voltage is unknown, the transformer will be adjusted to 220 v in the factory.

Single-knop control

The single-knob scoarse- and fine focusing control on both sides of the stand permits very rapid and reliable operation in all ranges of magnification.

The mechanism functions as coarse adjustment if the operating knob is rotated in one direction only. The fine adjustment is engaged automatically as the rotation is reversed. Its range covers approx. 1/3 turn of the operating knob. Movement beyond this range will produce a slight resistance which indicates that the coarse adjustment is again engaged.

When focusing a specimen it is advisable first to move the coarse adjustment a little beyond the critical focusing position of the image; optimum sharpness is obtained by reversing the rotation. This preserves enough freedom of movement for final focusing with the fine adjustment without reaching its limits even after a change-over to more powerful objectives.

Operating the microscope

Focusing the specimen

Secure a contrasty section on the object-stage by means of an object guide or stage clips, turn in a medium-to-low power objective, preferably 10x, N. A. 0.25 (engraved 10/0.25), and insert a Huygens 10x or PERIPLAN 8x eyepiece.
Switch on the lamp.
Focus the specimen with the single-knob control. Raise the stage a little higher than required by the free working distance of the objective, so that the image again appears a little out of focus. Final focusing is obtained by reversing the rotation of the single-knob control.
When the binocular tube is used, correct for interpupillary distance and any visual defects as described under chapter "Tubes". This should be repeated after the condenser has been focused, and checked from time to time.

Illumination of the microscopic image

Perfect illumination of the specimen is essential for a good microscope image. The following paragraphs are therefore of particular importance and should be closely adhered to.
Adjusting the mirror. Open the aperture diaphragm of the condenser fully. Look through the eyepiece, moving the mirror until light enters the objective; remove the eyepiece, and adjust the mirror until the rear lens of the objective is evenly filled with light. It may be necessary for this purpose to lower the condenser slightly. Now replace the eyepiece and check the illumination of the microscopic image.
The micro-dia lamp attachment is locked in the foot of the stand; it does not need special centering.
Adjusting the 6 v 15 W lamp attachment. It is advisable to check the adjustment of the 6 v 15 W lamp before observation is begun. Unscrew the clamping screw (11/17) and push the lamp mount fully home.
By slowly withdrawing the lamp form the smallest possible image of a patch of light on the dust glass of the lamp. After loosening the clamping screw (11/18), this circular patch can be centred on the dust glass by adjusting the lamp mount.
Then, while steadily looking into the microscope, the lamp mount should be pushed in again until the very best illumination of the microscopic image is obtained. Tighten the fixing screw (11/17) again.

Use of the condensers

a) **Condenser No. 65**
Turn in objective 10/0.25.
Raise the condenser fully.
Open aperture diaphragm (4/8) fully.
Focus the specimen with the single-knob control.
The specimen now appears uniformly bright throughout. However, it may be possible to increase the brightness by slightly lowering the condenser, especially after the change-over to higher-power objectives. Remove the eyepiece from the tube. Slowly close the aperture diaphragm until it obscures $^1/_3$ of the rear lens of the objective. A few remarks about the correct use of the aperture diaphragm will be appropriate in this context. You will be well advised to pay close attention to this point, since the performance of the microscope largely depends on it.
While with specimens of normal contrast range the aperture diaphragm can be closed so that it obscures $^1/_3$ of the rear lens of the objective at the outset, the following procedure is advisable for specimens of little contrast: — Open the aperture diaphragm so that it is only just visible in the rear lens of the objective (remove the eyepiece), when the aperture of the condenser and that of the objective will be identical. After sufficient sharpness has been obtained in all the object details, gradually close the condenser diaphragm until the less contrasty structural elements also become conspicuous. In the majority of cases it will be advisable to close it so that it reveals about $^2/_3$ of the full objective aperture. Any further closing of the diaphragm leads to a rapid decrease in the resolving power of the objective and therefore of the performance of the microscope. The aperture diaphragm must not be used for regulating the image brightness. This

should be done either by means of the transformer, or, in the case of colour photomicrography, with neutral density screens.

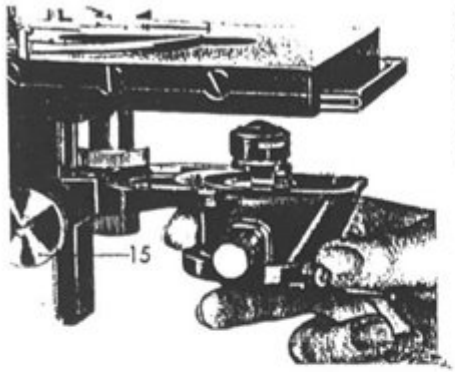

Fig. 12
Inserting the swing-out condenser No. 601
15 knob for lowering the condenser dovetail changer
the rigid version of the swing-out condenser No. 601 must be inserted with the condenser top swung-out.

b) Condenser No. 66
Turn in objective 10/0.25
Focus specimen with the single-knob control
Loosen clamping screw (3/14) (with older models only)
Raise condenser fully (clockwise turn of the condenser mount)
Open the aperture diaphragm (5/8) fully. The image appears uniformly bright, however, the brightness can be further increased by slightly lowering the condenser.
Remove the eyepiece from the observation tube.
Check full illumination of the rear lens of the objective; if necessary correct vertical condenser adjustment slightly.
Tighten clamping screw (3/14) (with older models only)
Slowly close the aperture diaphragm until it reveals only ²/₃ of the rear lens of the objective (For details about the use of the aperture diaphragm see also condenser No. 65 — p. 8).
Insert the eyepiece.

Fig. 13
Appearance of the aperture diaphragm in the objective, with the eyepiece removed

c) Swing-out condenser No. 601
This condenser can be centred. Its centration should be checked from time to time.
For the SM with condenser dovetail change the swing-out condenser No. 601 is supplied without centring device.

1) Centring with the 220 v 15 W micro-dia lamp attachment or the 6 v 15 W lamp attachment

Switch on illumination
Turn in objective 3.5/0.10 or 2.5/0.07.
Focus the specimen
Swing in condenser top (knob 7/16)
Open aperture diaphragm (7/8) fully
Slowly lower the condenser from its top position until the edge of the diaphragm of the micro-dia lamp attachment, or the rim of the collector lens of the 6 v 15 W lamp attachment appears sharp in the microscope field of view.
Centre the edge of the diaphragm or the rim of the collector lens with the image by means of the condenser centring screws (7/7).
Raise the condenser fully
Close the aperture diaphragm according to the object and the objective; see also p. 8.

2) Centring with the microscope mirror

Turn in objective 10/0.25
Remove microscope mirror. This reveals the mirror bush, which can be used for centring by illuminating it with a table lamp etc.
Focus the specimen
Swing in the condenser top (knob 7/16).
Lower the condenser from its top position until the mirror bush appears sharp in the microscope.
Centre the mirror bush in the image by means of the condenser centring screws (7/7).

Raise the condenser fully
Replace the microscope mirror
Remove the eyepiece and adjust the mirror until the rear lens of the objective is evenly illuminated (see p. 8)
Replace the eyepiece
The following table provides information about the use of the swing-out condenser No. 601 with the various objectives.

Objective aperture	Condenser top	Vertical adjustment of the condenser
larger than 0.25	remains swung in	remains in topmost position
smaller than 0.25	swing out	Lower condenser until the best illumination is produced

d) **Condenser No. 72r**
cf. Swing-out condenser No. 601

Change of magnification

As all LEITZ objectives from 3.5/0.10 upwards are parfocal on the revolving nosepiece, only slight refocusing with the fine adjustment is necessary when the magnification is changed.

Oil immersion objectives

Immersion objectives are identified by the engraved black ring at the lower end of the mount and by the word "öl" (see p. 6).
The refractive index of the immersion oil, n = 1.515, is approximately the same as that of the coverglass and the front lens of the objective, which makes the spherical surface of the objective front lens the first refracting surface after the object. The focal length and hence the working distance of most immersion objectives are very short; great care is therefore necessary in their use. They must be focused under constant microscopical control. The formation of air bubbles must be avoided when the immersion oil is applied. Only LEITZ immersion oil and, for fluorescence microscopy, LEITZ non-fluorrescing immersion oil should be used.

Condenser and oil immersion

Generally, a condenser aperture of 0.90 is completely adequate for the majority of examinations with dry and with oil immersion objectives (N. A. 0.90 corresponds with stopping an objective aperture of 1.40 down by $^3/_5$). It will be necessary in comparatively few cases only to illuminate the entire objective aperture. Maximum resolving power of an objective is almost invariably bought at a loss in contrast, so that the theoretical resolving power is only rarely obtainable. Only when the resolution of the very finest structures is essential will a condenser of an aperture larger than 0.90 be called for (i. e. our condensers No. 66 or 72r). In this case, the condenser, too, must be immersed.

i. e. oil must be introduced between condenser top and the underside of the object slide.

Working with oil immersion

Open the aperture stop of the condenser (8), and lower the stage with the single-knob control. Place a drop of oil on the coverglass of the specimen, raise the stage, observing its movement across the stage top, until the objective dips into the immersion oil. Look through the eyepiece and focus the specimen carefully by first moving slightly beyond the focusing plane with the coarse adjustment, and obtaining critical sharpness with the fine adjustment.

Close the aperture diaphragm to suit the requirements of the specimen.

If the large apertures of the condensers No. 66 or 72r must be utilized fully (extremely fine object structures), immersion oil must be introduced between the front lens of the condenser and the underside of the object slide. The condenser No. 72r should be slightly lowered for this purpose with the rack-and-pinion movement (4/15).

The examination completed, all optical surfaces in contact with immersion oil must be carefully cleaned with a soft rag soaked in xylene, and polished with a dry rag. **Alcohol (spirit) must never be used for cleaning objectives and condensers.** All pressure must be avoided during cleaning as this might push the lenses out of their mounts. In most cases this would damage not only the front lens, but also the following member of the objective.

Tube: straight monocular tube 0

Light sources: —

1) **220 v 15 W Micro-dia lamp attachment** This lamp includes a built-in daylight filter, but should be used only for black-and-white photomicrography, since with colour material the colour balance will be disturbed in the various spectral regions. It is of course suitable for visual observation. The use of a yellow-green filter is an advantage in black-and-white photography.

2) **6 v 15 W lamp attachment.** The colour temperatures of this filament lamp are matched for artificial-light films. The curve shown in Fig. 14 illustrates the dependence of the colour temperature on the current intensity and makes it possible to adapt the lamp to the chosen artificial-light film by regulating the current. However, care should be taken to exceed the admissible continuous load of 2.5 amp. only for the actual period of photography in order to avoid a considerable shortening of the life of the lamp. Daylight colour films can be used with the aid of the conversion filter included with the lamp; the current load must be 2.5 amp. Any excess of light must be suppressed by means of neutral density screens, never by operating the operture stop.

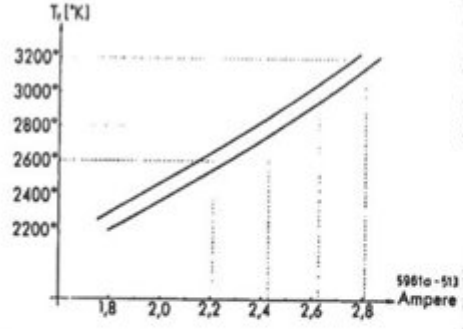

Fig. 14

3) **150 W xenon high-pressure lamp.** This can be used in the lamp housing 250 only. Its practically continuous spectrum, at a colour temperature of 6000° K, permits the use of daylight colour film without filter. Any excess light should be reduced with neutral density screens.

Objectives: Standard objectives, i. e. achromats, fluorite systems or apochromats depending on the optical outfit of the microscope.

Eyepieces: Huygens, PERIPLAN®, or PERIPLAN widefield eyepieces

Exposure meter: — MICROSIX-L

The SM microscope can be combined with the following photographic equipment:

SM with ARISTOPHOT

and 9 x 12 cm bellows camera
or bellows camera with 4" x 5" international back
or the LEICA®.

SM with 9 x 12 cm attachment camera

SM with micro-attachment, or micro-attachment for the LEICA with vibration absorber and the LEICA.

For detailed information please consult our lists 54-8, 54-3 and 54-22.

Special methods of microscopy

Examinations in darkfield illumination and phase contrast

In SM models with dovetail changer and rack-and-pinion movement for vertical condenser adjustment the brightfield condenser can be replaced by the darkfield or by the phase contrast condenser. In the latter case the objectives, too, must be replaced by phase contrast objectives on the nosepiece; care should be taken to screw them into the numbered threads indicated in the objective/eyepiece table included with the microscope. Our list 51-31 contains detailed instructions about the use of darkfield illumination and list 51-21 about the use of phase contrast equipment.

Examination in polarized light

In the condensers No. 65, 66, and 72r the mount of the polarizer is screwed into the swing-out filter holder. The mount has a slot for the λ or λ/4 plate and can in turn be swung out on the filter holder.

The swing-out condenser No. 601 ist equipped with a special polarizing device to be attached to its bottom part; it has a swing-out mount with two slots for the polarizer and λ or λ/4 plates. Polarizer and compensator can be rotated through 90°.

The analyser is pushed over the ring with locating lug visible in the top of the tube carrier after removal of the tube. Extinction is produced by rotating the polarizer.

Maintenance and care of the microscope

The microscope should be kept under its dust cover when not in use. The stand should be cleaned occasionally with a piece of linen or chamois leather. On no account should spirit be used for cleaning as it attacks the varnish of the microscope. Benzene, on the other hand, is most suitable for this purpose.

Bright patches on the object stage caused by benzene are easily removed by treating them with liquid paraffin or acidfree vaseline.

Special caution is necessary during examinations involving acids particularly acetic acid) or other corrosive substances. Their direct contact with optical parts and the stand must be strictly avoided, and all parts should be thoroughly cleaned after use.

The optical parts of the microscope should be kept scrupulously clean. Dust on glass surfaces is removed by brushing with fine, dry sable brush, accompanied by gently blowing across the surface. If the dirt resists this treatment it should be removed with a piece of clean linen or soft leather soaked in distilled water. If this method, too, is unsuccessful, benzene or xylene, but on not account alcohol (spirit), should be used.

Objectives must never be unscrewed for cleaning. If they have sustained internal damage they should be sent to the factory for repair.

Special care is recommended during the cleaning of the antireflex layers of the lenses. The external surfaces of the eyepieces and the front lenses of the objectives are coated with layers as hard as glass. They should be cleaned with the same care as uncoated surfaces. On the other hand, some of the layers on the internal surfaces of eyepieces and objectives are extremely soft, and here the only method of removing dust is by blowing it gently away. It is therefore inadvisable to clean the internal surfaces, even of eyepieces.

Expert care ensures optimum performance of a LEITZ microscope for many years. However, should the overhaul or repair of an instrument become necessary, please contact one of our agencies or our factory.

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Tubusfaktoren · Tube factors
0.8 x ◄— 1 x —► 1.25 x

Vergrößerungstabelle
für LEITZ-Mikroskope

Magnification table
for LEITZ microscopes

Objektiv-vergrößerung	Gesamtvergrößerung mit Huygens- bzw. PERIPLAN-Okularen						
	6.3 x	8 x	10 x	12.5 x	16 x	20 x	25 x
Objective magnification	Total magnification with Huygens and PERIPLAN eyepieces						
	6.3 x	8 x	10 x	12.5 x	16 x	20 x	25 x
2.5	16	20	25	32	40	50	63
3.2	20	25	32	40	50	63	80
3.5	22	28	35	45	55	70	90
3.8	24	30	38	48	60	76	95
4	25	32	40	50	63	80	100
5	32	40	50	63	80	100	125
5.6	35	45	56	70	90	110	140
6	40	50	60	75	100	120	150
6.5	40	52	65	80	105	130	165
8	50	63	80	100	125	160	200
10	63	80	100	125	160	200	250
11	70	90	110	140	175	220	275
12.5	80	100	125	160	200	250	320
16	100	125	160	200	250	320	400
20	125	160	200	250	320	400	500
22	140	175	220	275	350	440	550
25	160	200	250	320	400	500	630
32	200	250	320	400	500	630	800
40	250	320	400	500	630	800	1000
45	285	360	450	550	725	900	1125
50	320	400	500	630	800	1000	1250
54	340	430	540	675	860	1080	1350
55	345	440	550	690	880	1100	1375
60	380	480	600	750	960	1200	1500
63	400	500	630	800	1000	1250	1600
70	450	550	700	875	1125	1400	1750
75	475	600	750	950	1200	1500	1875
80	500	630	800	1000	1250	1600	2000
90	565	720	900	1125	1450	1800	2250
95	600	760	950	1200	1525	1900	2375
100	630	800	1000	1250	1600	2000	2500
105	650	850	1050	1325	1675	2100	2625
160	1000	1250	1600	2000	2500	3200	4000

Die Gesamtvergrößerungen beziehen sich auf den Tubusfaktor 1 x. Die Vergrößerungen für die Tubusfaktoren 0.8 x bzw. 1.25 x sind in der Tabelle auffindbar, indem man von dem gefundenen Wert „Tubusfaktor 1 x" in die benachbarte Spalte nach links = 0.8 x bzw. nach rechts = 1.25 x wechselt.

Alle durch Fettdruck gekennzeichneten Vergrößerungswerte entsprechen den Normvergrößerungen, die durch Multiplikation einer Objektiv- und einer Okular-Normvergrößerung zustande kommen. Die übrigen Vergrößerungswerte sind – soweit es sich nicht von selbst ergibt – auf runde Werte gebracht.

The total magnifications refer to the tube factor 1 x. The magnifications for the tube factors 0.8 and 1.25 are found in the table by moving to the left for 0.8 x, and to the right for 1.25 x from the value found for the tube factor 1 x.

All magnification values printed in bold type correspond to the standard magnifications obtained by multiplying an objective- and an eyepiece standard magnification. The other magnification values are rounded off where necessary.

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Facteurs de tube • Factores del tubo
0.8 x ◄— 1 x —► 1.25 x

Table de correspondance des grandissements totaux

pour tous microscopes LEITZ

Tabla de aumentos

para los microscopios LEITZ

Grandissement propre de l'objectif	Grandissement total atteint avec les oculaires Huyghens ou avec les oculaires périplanétiques						
	6.3 x	8 x	10 x	12.5 x	16 x	20 x	25 x
Aumento del objetivo	Aumento total con oculares Huygens o PERIPLAN						
	6.3 x	8 x	10 x	12.5 x	16 x	20 x	25 x
2.5	16	20	25	32	40	50	63
3.2	20	25	32	40	50	63	80
3.5	22	28	35	45	55	70	90
3.8	24	30	38	48	60	76	95
4	25	32	40	50	63	80	100
5	32	40	50	63	80	100	125
5.6	35	45	56	70	90	110	140
6	40	50	60	75	100	120	150
6.5	40	52	65	80	105	130	165
8	50	63	80	100	125	160	200
10	63	80	100	125	160	200	250
11	70	90	110	140	175	220	275
12.5	80	100	125	160	200	250	320
16	100	125	160	200	250	320	400
20	125	160	200	250	320	400	500
22	140	175	220	275	350	440	550
25	160	200	250	320	400	500	630
32	200	250	320	400	500	630	800
40	250	320	400	500	630	800	1000
45	285	360	450	550	725	900	1125
50	320	400	500	630	800	1000	1250
54	340	430	540	675	860	1080	1350
55	345	440	550	690	880	1100	1375
60	380	480	600	750	960	1200	1500
63	400	500	630	800	1000	1250	1600
70	450	550	700	875	1125	1400	1750
75	475	600	750	950	1200	1500	1875
80	500	630	800	1000	1250	1600	2000
90	565	720	900	1125	1450	1800	2250
95	600	760	950	1200	1525	1900	2375
100	630	800	1000	1250	1600	2000	2500
105	650	850	1050	1325	1675	2100	2625
160	1000	1250	1600	2000	2500	3200	4000

Les grandissements totaux indiqués ci-contre se rapportent au coefficient de facteur de tube de 1 x. Il suffit de se reporter dans la colonne la plus proche, à gauche pour le facteur 0.8, et à droite pour le facteur 1.25, pour trouver sur la même ligne que celle du grandissement 1 fois, le grandissement correspondant au facteur 0.8 ou au facteur 1.25.

Tous les rapports de grandissement **imprimés en caractères gras** sont des rapports conformes aux normes, obtenus par la multiplication du rapport de l'objectif avec le rapport normalisé de grossissement d'un oculaire. Les autres rapports de grandissement ont été exprimés en valeurs arrondies chaque fois que cela était nécessaire.

Los aumentos totales se refieren al factor del tubo de 1 x. Aquellos que corresponden a los factores de 0.8 x o de 1.25 x se hallarán en la tabla, pasando desde el valor obtenido para el "factor del tubo 1 x" hasta la columna contigua de la izquierda = 0.8 x o hasta la columna contigua de la derecha = 1.25 x.

Todos los valores indicados en negrillas representan los aumentos que se obtienen multiplicando el aumento normalizado de un objetivo por el de un ocular. Los demás valores están redondeados, siempre que no sean producto de sí mismos.

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