METALLOPLAN

Largefield Metallographic Microscope

Leitz WETZLAR

Instructions

560-25/Engl.

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Instructions

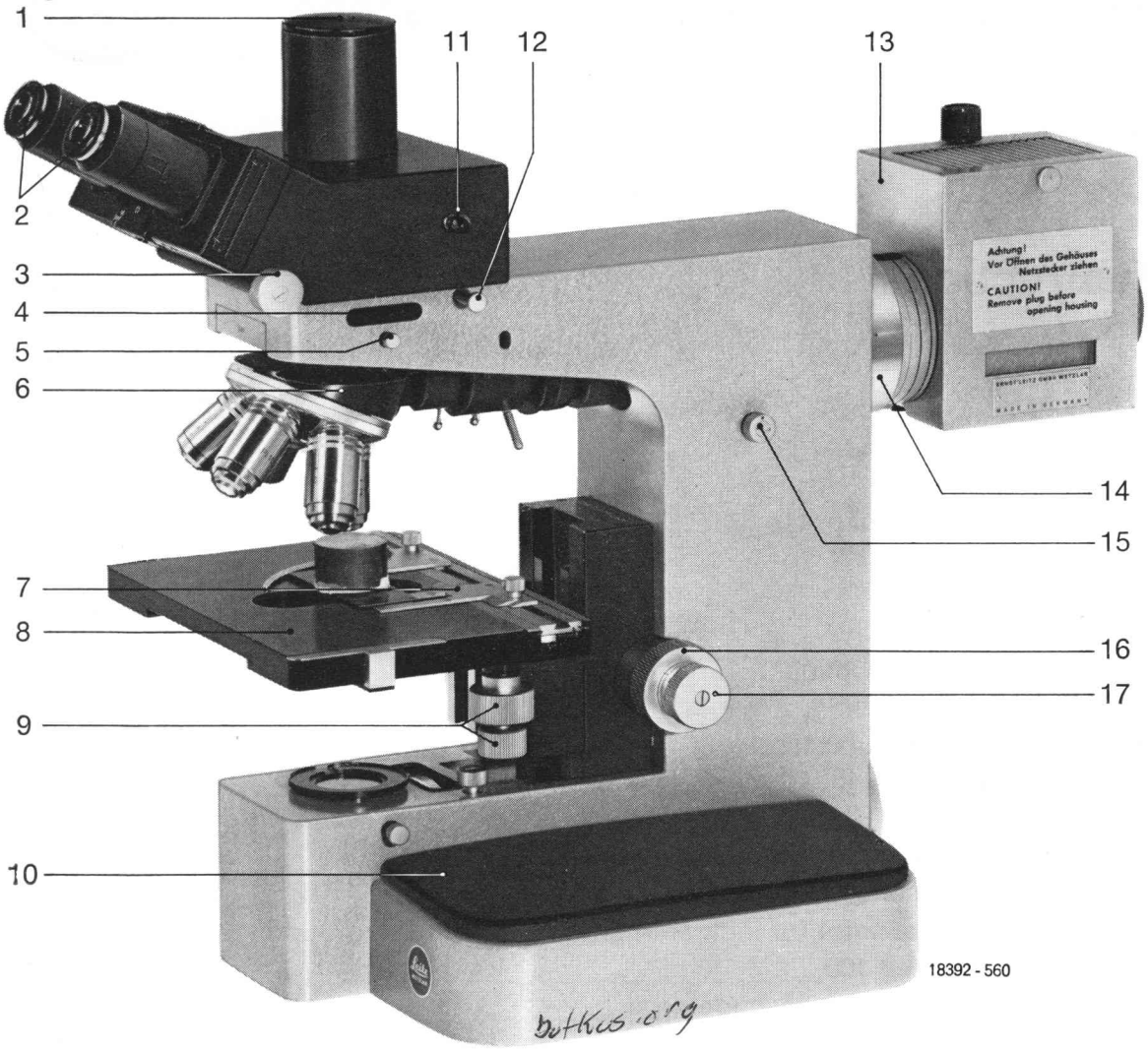

Fig. 1
METALLOPLAN Largefield Microscope

1 Detachable cap in the photo tube
2 GW/GG eyepieces in the eyepiece tubes
3 Knob for adjusting the interpupillary distance
4 Slot for filter slide
5 Clamping screw for the illuminator
6 Vertical illuminator (interchangeable)
7 Object holder
8 Large square mechanical stage No. 661
9 Co-axial controls for the mechanical adjustment of the sample
10 Plastic handrest
11 Lever for operating the beam splitter
12 Locking lever for tube changing
13 Lamp Housing 100
14 Bayonet ring for attaching the lamp housing
15 Changing knob for the swing-out lens
16 Coarse adjustment
17 Fine adjustment

1 Technical description

The stand rests on 4 built-in vibration damping special plastic supports. The co-axial fine and coarse adjustment Fig. 1.16* and 17 acts directly on the object stage 1.8. The fine adjustment 1.17 operates throughout the total travel of 40mm. One interval on the fine adjustment drum corresponds to 1 μm.

The largefield binocular tube with vertical photo-tube is joined to the stand by means of a bayonet lock. It can be rotated through 360°. The mechanical tube length compensator 1.3 built into the tube maintains simultaneous focusing in the film plane and eyepiece for all interpupillary distances; refocusing for photomicrography has become unnecessary.

A beam splitter in the tube directs 80 % of the total light into the photo-tube and 20 % into the eyepiece tube. The beam splitter 1.11 can be swung out of the optical path so that the full light flux is directed into the eyepiece tubes for observation.

The eyepiece tubes are designed to accept largefield eyepieces 1.2 of 30mm diameter. 23.2mm diameter PERIPLAN® eyepieces are used with adapters.

The object stage 1.8 is interchangeable on a dovetail slide and can be lowered considerably for high objects. The co-axial control of the stage 1.9 must be operated from the right. The vertical illuminator 1.6 can be interchanged horizontally without the need for lowering the object stage.

The light collar between the vertical illuminator and the light aperture in the stand has 2 filter slots.

The standard outfit of the METALLOPLAN metallographic microscope includes a Lamp Housing 100, Fig. 1.13. Like the Lamp Housing 250 or mirror housing, which are also attachable, it is directly joined to the microscope by means of the bayonet lock 1.14.

* Fig. 1.16 indicates item 16, Fig. 1.

2 Technical details

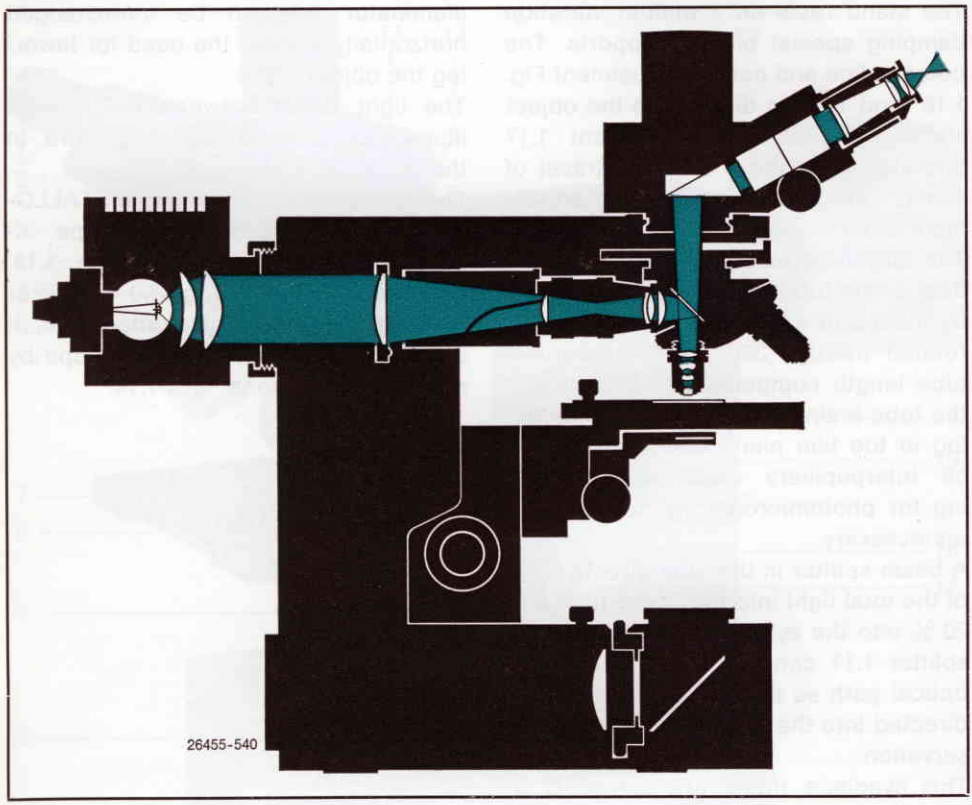

Abb. 2
Beam in the METALLOPLAN

The various components such as object stage, tubes, vertical illuminator, etc., are described in detail in our list No. 560-24 METALLOPLAN. The following paragraphs contain the directions necessary for operation.

2.1 Tube

The FSA-GW binocular tube for the METALLOPLAN has been designed to accept eyepieces of 30mm diameter. It has a hinged beam splitting prism 3.11, which divides the beam at a 4:1 ratio of light intensities (80 % for photomicrography, 20 % for visual observation) or directs the entire light flux into the eyepiece tubes. The interpupillary distance is set with the knurled knob 3.3. Here the optical length compensation maintains critical focusing both in the eyepiece and in the film plane irrespective of interpupillary distance. When this value is unknown the interpupillary distance setting is adjusted during binocular observation until only a single circular and easily surveyed field of view is seen. In addition, the GW- and the GG eyepieces have focusing eyelenses.

Eyepieces of 23.2mm diameter are used with adapters, Code No. 513 256.

2.2 Objectives

Every LEITZ microscope objective has a number of details engraved:

∞, these objectives have been computed for the tube length "infinity". This means that the intermediate image is formed at infinity. Only when a tube lens, a system of 200mm focal length permanently built into the vertical illuminator for incident-light bright-field, is used will the intermediate image be formed in the eyepiece tube. The magnification difference produced by the tube lens is called the tube factor, which is engraved on the vertical illuminator. It must be allowed for when the total magnification is calculated (see also table on p. 32).

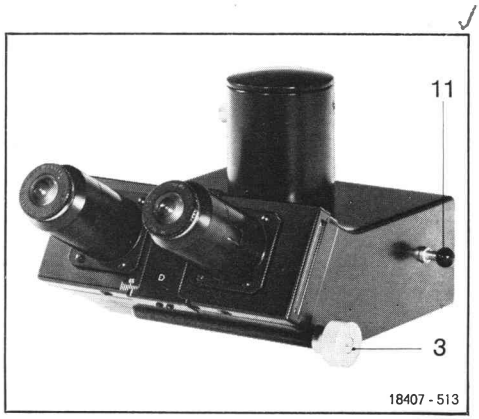

Fig. 3
FSA-GW binocular tube

Fig. 4
Pl Oel 160/1.40 incident-light objective

DO: objectives can be used with or without coverglass, O: objectives must not be used with coverglass.
These details can also be found in the table on p. 7. Below the detail of tube length and coverglass correction the following data will be found:
Reproduction ratio, e.g. 32 x, numerical aperture, e.g. /0.50. In addition, the state of correction is indicated by certain letters in front of the magnification value:

Pl = plano objective
Fl = fluorite system
Apo = apochromat
R = radiation-resistant objective

Objectives without any letters in front of the magnification value are conventional achromats.
Objectives to be used only in an immersion medium (e.g. immersion oil) are engraved to this effect (e.g. Pl Apo Oel 160 x/1.40). In addition all immersion objectives have a black ring in the bottom third of the objective mount for quick identification. Incident-light phase contrast objectives have the additional designation **Phaco.**
Objectives for incident-light brightfield/darkground observation have the designation **HD.**
All high-power systems have a spring-loaded front mount to protect the front lens.
All LEITZ-incident-light objectives for metallographic microscopes have an adjustment length of 45mm. This means that after correct focusing the distance between the shoulder of the objective in the revolving nosepiece and the top surface of the object is 45mm. Change of magnification therefore requires only minor refocusing with the fine adjustment. The working distance (distance between the objective front lens and the top surface of the object) differs in the individual objectives because of their different total length.
The tables on the facing page provide information on all important details.

Plano objectives for metallographic microscopes
Incident-light brightfield and polarized light
∞/0/45mm

Type of objective	Engraving primary magnific./aperture		Free working distance mm	Focal length mm	Coverglass correction
Achromats	Pl R 2 x*	0.04	18	125	D O
	Pl 3.2 x	0.06	12	78	D O
	Pl 8 x	0.18	13	32	D O
	Pl Oel 8 x	0.18	0,14	32	D O
	Pl 16 x	0.30	7,0	16	D O
	Pl Oel 16 x	0.30	0,21	16	D O
	Pl 32 x	0.50	1,5	7,9	O
	Pl 80 x	0.95	0,03	3,1	O
	Pl 160 x	0.95	0,08	1,6	O
Apochromat	Pl Apo Oel 160x	1.40	0,27	1,6	O

* only in combination with pol-vertical illuminator
centring collar extra, Code No. 562 028

Incident-light phase contrast objectives for metallographic microscopes
∞/0/45mm

Type of objective	Engraving primary magnific./aperture		Free working distance mm	Focal length mm	Coverglass correction
Achromatic dry systems Phaco	Phaco 5 x	0.09	12	50	D O
	Phaco 10 x	0.18	13	25	D O
	Phaco 20 x	0.35	1,0	12	D O
Fluorite systems Phaco	Phaco Fl 50 x	0.85	0,26	5,0	O
	Phaco Fl 100 x	0.95	0,09	2,5	O

Plano objectives for metallographic microscopes
Incident-light darkground and (brightfield)
∞/0/42mm, special thread M 30 x 0.75

Type of objective	Engraving primary magnific./aperture		Free working distance mm	Focal length mm	Coverglass correction
Achromats	D Pl 16 x	0.30	6,9	16	D O
	D Pl 32 x	0.50	2,0	7,8	D O
	D Pl 80 x	0.75	0,16	3,2	O

2.3 Eyepieces

In the optical system of the microscope objective and eyepiece form a unit. In the METALLOPLAN largefield microscope field-of-view indices of up to 28 can be obtained depending on the optical equipment. The field of view of an eyepiece is the area of the intermediate image in the tube that can be surveyed with the eyepiece. The diameter of the image formed by a GW 6.3 x eyepiece of 28mm field-of-view diameter (field-of-view index 28) appears to have the same dimension as the diameter 6.3 x 28 = 176mm of an area at a distance of 250mm in front of the observer. At this size the image can also be reproduced 250mm above the eyepiece on a ground-glass screen.

Object field

If the diameter of the field of view is divided by the objective magnification and the tube factor the diameter of the object field that can be observed is obtained. With the above-mentioned eyepiece and a 32 x/0.50 objective and 0.8 x tube factor an object field of

$$\frac{28}{32 \cdot 0{,}8} = 1.1\text{mm}$$

diameter will be observed.

Eyepieces are generally computed so that the observer's eye must be about 8 to 10mm above the top surface of the eyelens of the eyepiece. This is called the pupillary distance.

High-point eyepieces have a pupillary distance of about 20mm and therefore allow observation through spectacles and thus a compensation of the astigmatism of the eye. The upper rim of the high-point eyepieces consists of a special plastic material which prevents scratches on the spectacle lenses.

The tables below list the eyepieces that can be used on the METALLOPLAN metallographic microscope.

GW PERIPLAN widefield eyepieces (30mm ⌀)	
Designation	Field-of-view index
GW 6.3 x	28
GW 8 x	26
GW 10 x	24
GW 10 x M	24
High-point eyepieces	
GW 6.3 x	28
GW 10 x	22

GF PERIPLAN widefield eyepieces (23.2mm ⌀)	
GF 10 x	18
GF 10 x M	18
GF 12,5 x	18
GF 12,5 x M	18
GF 16 x	15
GF 25 x	10
GF 25 x M	10

Further details of objectives, eyepieces, and available graticules for GF and GW PERIPLAN eyepieces are contained in our list "Image-forming and Illuminating Systems of the Microscope" No. 512-99.

2.4 Vertical illuminator for incident-light brightfield with plano objectives

The vertical illuminator consists of the horizontal changing slide 5.18, the quintuple objective revolving nosepiece 5.22 for plano objectives 5.23, an aperture 5.26 and a field diaphragm 5.25 in the light tube 5.24, which houses the illuminating optical system 5.21. The 0.8 x tube lens system 5.19 is installed in the changing slide. The objective revolving nosepiece has 5 threaded bushes for the objectives. The bushes are numbered. Each outfit is accompanied by an objective/eyepiece chart. Among other information it indicates which nosepiece thread the individual objectives are matched with. If possible the objectives should not be removed from the nosepiece. Should this become necessary, care must be taken that they are replaced in their proper threaded bush.

2.5 Vertical illuminator for incident-light phase contrast

The vertical illuminator consists of the horizontal changing slide 6.18, the quintuple objective revolving nosepiece 6.22, and a rotating light ring drum 6.30 which contains 4 annular stops for the various magnifications in phase contrast and a changing lever 6.29 for brightfield illumination. The 1 x tube lens system 6.19 is installed in the changing slide. The final magnifications obtained with a 10 x eyepiece are engraved 6.27 on the light ring drum. The annular stop necessary for the required magnification is in the optical path when the final magnification value is engaged in the top right as seen by the observer. The annular stop for 50 x magnification also serves for 100 x magnification. For observation in brightfield the drum can be set so that the word "hell" (German for bright) is set instead of a magnification value.

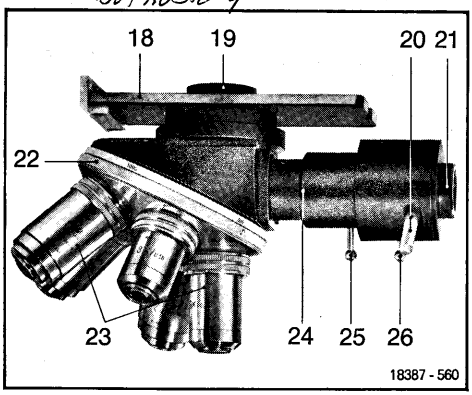

Fig. 5
Vertical illuminator for incident-light brightfield
20 Lever for decentring the aperture diaphragm

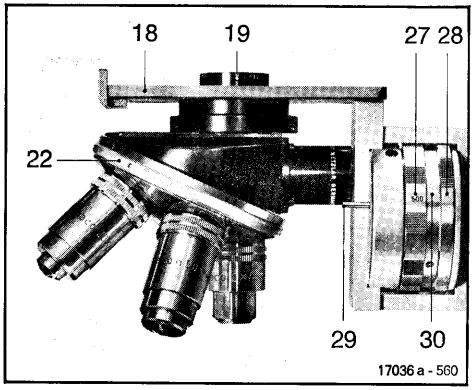

Fig. 6
Vertical illuminator for incident-light phase contrast
28 Setting ring of the aperture diaphragm

2.4 Vertical illuminator for incident-light brightfield with plano objectives

The vertical illuminator consists of the horizontal changing slide 5.18, the quintuple objective revolving nosepiece 5.22 for plano objectives 5.23, an aperture 5.26 and a field diaphragm 5.25 in the light tube 5.24, which houses the illuminating optical system 5.21. The 0.8 x tube lens system 5.19 is installed in the changing slide. The objective revolving nosepiece has 5 threaded bushes for the objectives. The bushes are numbered. Each outfit is accompanied by an objective/eyepiece chart. Among other information it indicates which nosepiece thread the individual objectives are matched with. If possible the objectives should not be removed from the nosepiece. Should this become necessary, care must be taken that they are replaced in their proper threaded bush.

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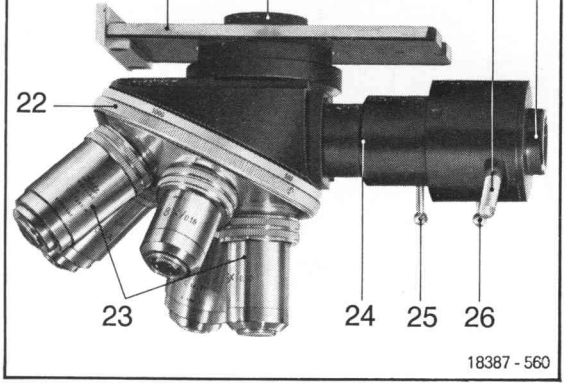

Fig. 5
Vertical illuminator for incident-light brightfield
20 Lever for decentring the aperture diaphragm

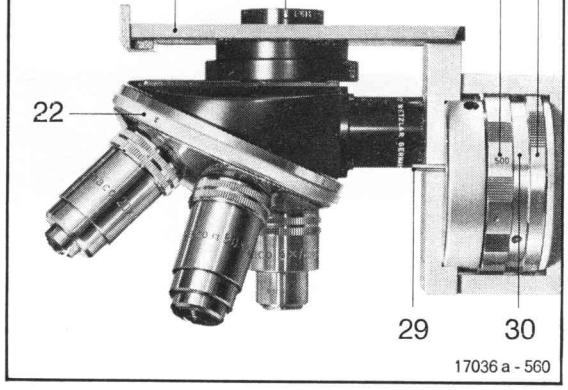

Fig. 6
Vertical illuminator for incident-light phase contrast
28 Setting ring of the aperture diaphragm

For comparison of brightfield and phase contrast the changing lever 6.29 can be operated so that the phase contrast beam is modified to give brightfield illumination suitable for comparison purposes. The individual annular stops for phase contrast are permanently centred in the factory before despatch, so that recentring will not be required. Should, however, resetting of an annular stop become necessary, the directions given in our list No. 560-6 should be followed.

2.6 Vertical illuminator for brightfield and darkground

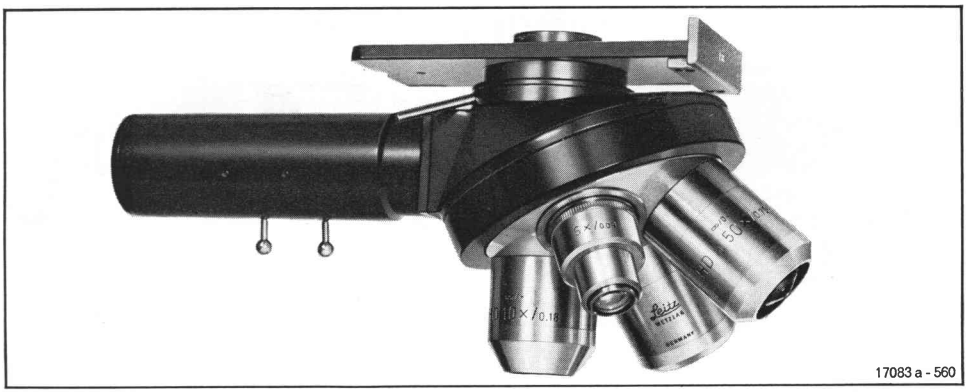

Fig. 7
Further details will be found in Instructions No. 560-23.

2.7 Lamp Housing 100

The Lamp Housing 100 is designed for the use of light sources of up to 100 W. Its normal version has a 2-lens frosted condenser, which for microphotometry must be replaced by a non-frosted one. The large connecting tube 8.35 with bayonet lock 8.14 is mounted on the housing with the cooling louvres. The connecting tube accepts the 3 filters. On the top is the knob 8.32 for the vertical adjustment of the lamp, and on the left (as seen by the observer) the controls for the lamp condenser 8.33 and for the horizontal adjustment 8.34 of the lamp. The lamp housing can be opened on the right after the knurled screw 8.31 has been unscrewed.

The lamp housing need not be opened for the exchange of the 12 v 60 W filament lamp. For this purpose only the lamp mount 9.38 is pulled out of the housing. Lightly push the filament lamp 9.37 into the mount, turn it to the left and remove it.

Insertion of the new lamp:

insert the filament lamp with the broad lug in the larger recess of the lamp mount, lightly push it in and lock it by a turn to the right. Fully insert the lamp mount into the tube and clamp it by means of the grub screw.

Evenly illuminate the rear focal plane of the objective by adjusting the lamp condenser 9.36 and simultaneous observation through the eyepiece tube. With the 12 v 60 W filament lamp centration is not necessary. The centration of the 12 v 100 W tungsten halogen lamp is described on p. 14 in the section "Operating the microscope".

The Instructions 514-119 contain detailed directions about other lamps and their use in the Lamp Housing 100 or 100 Z.

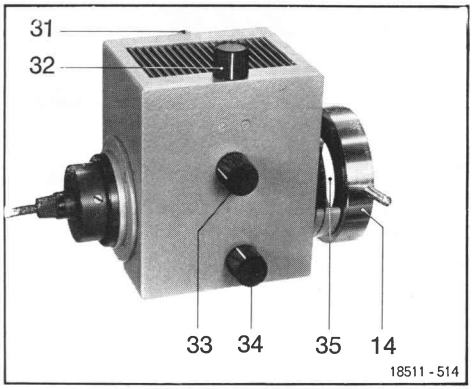

Fig. 8
Lamp Housing 100

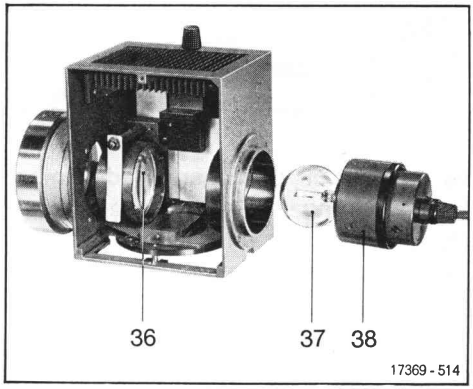

Fig. 9
Interchanging the filament lamp

3 Assembling the microscope

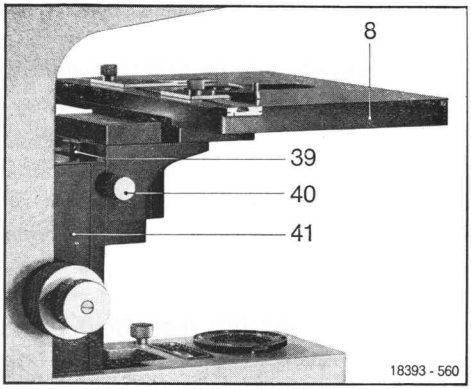

Fig. 10
41 Drive casing

Release clamping screw 10.40, insert object stage No. 661 10.8 in the changing guide 10.39 and lower it as far as possible.

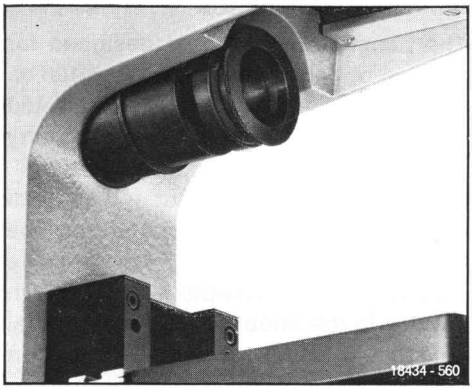

Fig. 11

Insert the diaphragm tube into the light aperture.

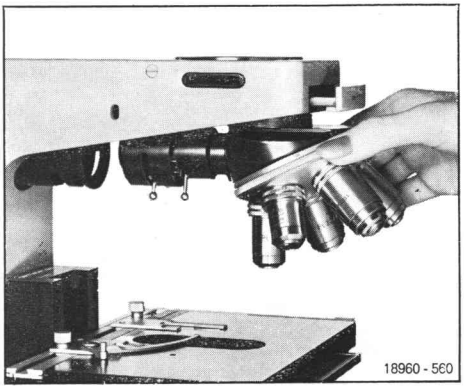

Fig .12

By means of the coarse adjustment lower the stage so that after the clamping screw 1.5 is released the vertical illuminator can be easily and fully inserted into the horizontal changing guide. Retighten the clamping screw. Depending on the height of the object raise the stage and fix it with clamping screw 10.40.

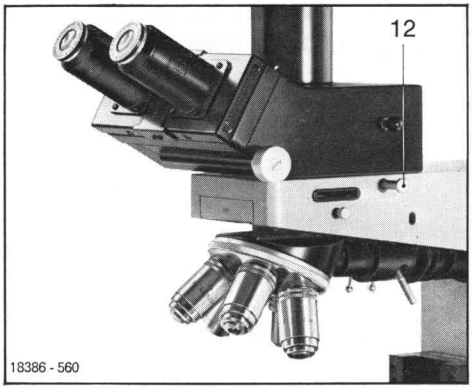

Fig. 13

Depress the locking lever 13.12 and insert the tube into the bayonet changing mount from above, at any rotation position. Release the locking lever 13.12. After insertion it must be possible to rotate the tube through 360° without effort. If the tube is to be clamped in a certain position, lightly pull the locking lever 13.12 out.

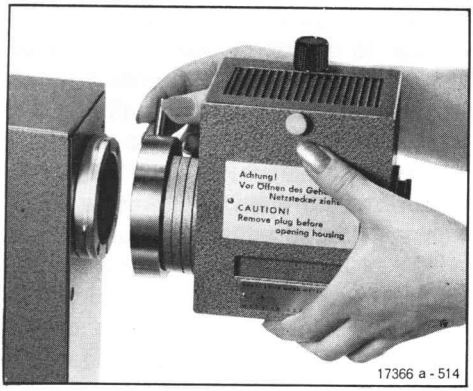

Fig. 14

Adjust the bayonet ring on the Lamp Housing 100 so that the red dot on the bayonet ring and lamp housing face each other. Attach the lamp housing to the stand and lock it by rotating the bayonet to the right. Connect the lamp housing to the mains via its transformer. Further information can be obtained from the Instructions "Lamp Housing 100 and 100 Z" No. 514-119.

4 Operating the microscope

4.1 Vertical illuminator for incident-light brightfield

The sample (polished section) on the metal object slide is pressed into plasticine by means of a handpress which must be kept in its lower position for some time so that the surplus plasticine can be squeezed out from under the block. The alignment of the polished section to the optical axis requires only a few seconds' preparation per section. The handpress has an adjustable stop to match the samples at the same level. As a result, series investigations require only minor refocusing with the fine adjustment every time a sample is changed. In addition, the objectives do not collide with the sample when the revolving nosepiece is rotated for magnification change.

Turn the regulating knob on the transformer to switch on the lamp and set the brightness most favourable for visual observation (about 4amp for the 12 v 60 W lamp) with it. The 12 v 60 W lamp in the Lamp Housing 100 is precentred. Centration is therefore unnecessary. Recentration is required when a 12 v 100 W tungsten halogen lamp is used. This is done with the vertical illuminator removed. The image of the light source is projected onto a centring disc held in front of the light aperture of the diaphragm tube and focused by adjustment of the lamp condenser 16.33. This light area is centred to the light aperture by means of the vertical and/or lateral adjustment 16.32 and 16.34 on the Lamp Housing 100. Further details are contained in Instructions No. 514-119.

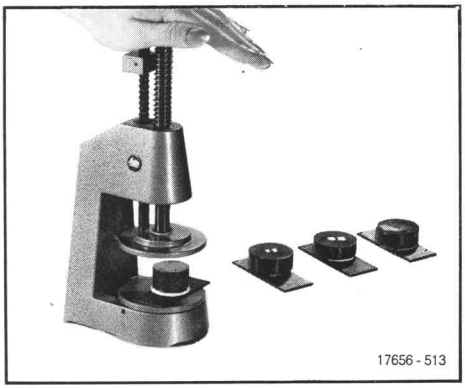

Fig. 15
Handpress with various polished sections

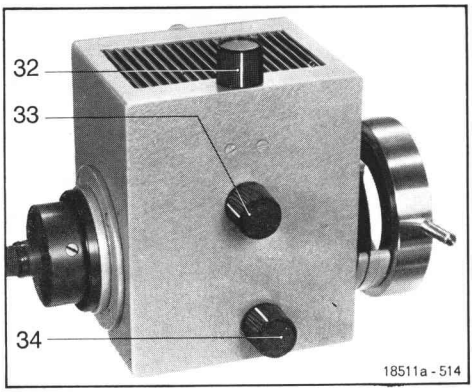

Fig. 16
Side view of the Lamp Housing 100

Replace the vertical illuminator as shown on Fig. 12, p. 12.

Turn in a low-power objective (e.g. Pl 8 x/0.18). Close the field diaphragm, open the aperture diaphragm, turn out the eyelens of the eyepieces until the engraved marking ring becomes visible. Raise the object stage with the polished section in position by means of the coarse adjustment and move it a little closer to the objective than the free working distance indicated in the table (for the Pl 8 x/0.18 about 13mm). Observe the image and lower the object stage until critical focusing has been achieved.

This procedure prevents accidental impact of the objective front lens on the sample and therefore damage to the objective or the sections.

Open the field diaphragm so that it just disappears beyond the edge of the field of view. This basic setting must be preserved for all objectives. When eyepieces of different field-of-view indices are used a corresponding readjustment of the field diaphragm is necessary.

Close the aperture diaphragm until the best possible contrast, but also optimum resolution of the object is obtained. Ensure optimum illumination by adjustment of the lamp condenser on the Lamp Housing 100.

The desired brightness of the microscopic image must not be produced by adjustment of the aperture diaphragm but only by regulation of the lamp brightness on the transformer.

4.2 Observations in phase contrast

Align the sample with the aid of the handpress as described under "Vertical illuminator for brightfield" (p. 14).

Clamp the sample 17.42 on the universally tilting object holder, place it on the object stage and align it roughly in a horizontal position.

Switch on the illumination with the regulating knob of the transformer. With the same control adjust the brightness until it is most favourable for visual observation (about 4 amp with the 12 v 60 W lamp). If necessary centre the lamp (12 v 100 W) (see p. 14). Insert the vertical illuminator for phase contrast with the phase contrast objectives screwed in position according to Fig. 12, p. 12.

After insertion of the necessary adapters, replace the GW eyepieces with the GF eyepieces. Turn out the eyelenses of the eyepieces until the engraved marking rings become visible.

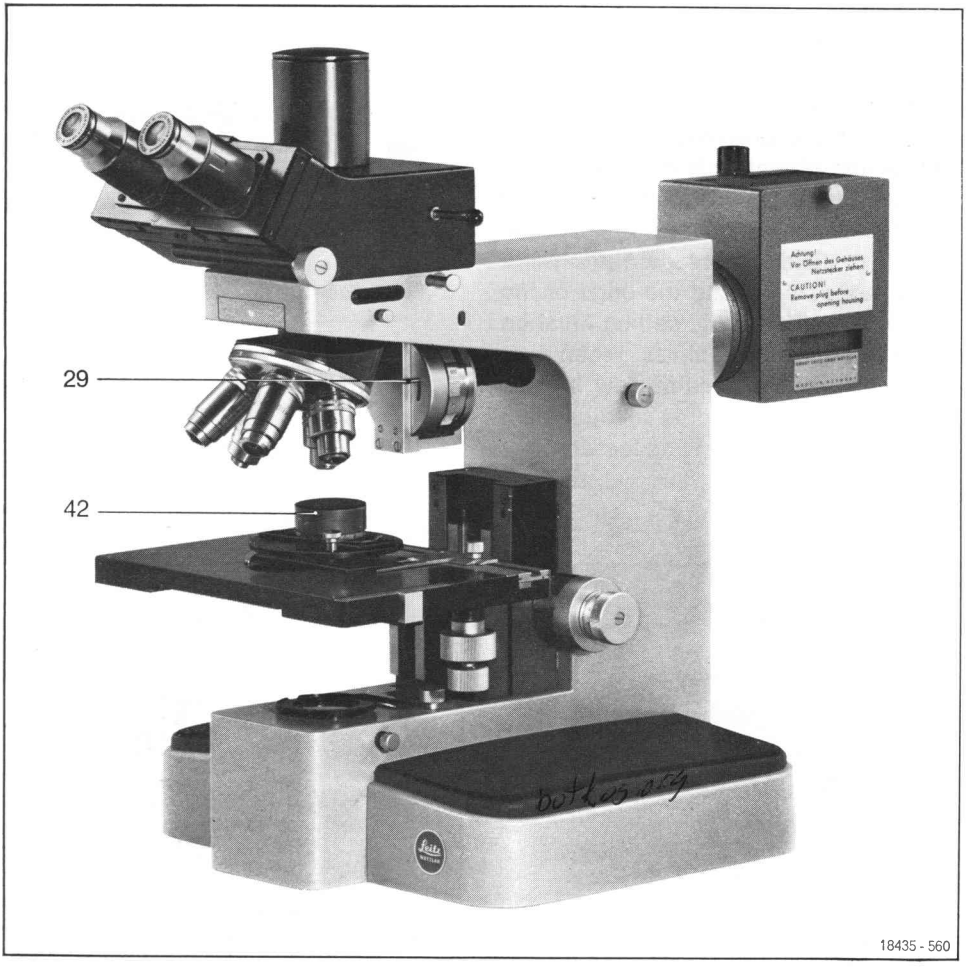

Fig. 17 METALLOPLAN with phase contrast device

Rotate the eyelens of eyepieces with graticules so that a sharp image of the graticule is obtained.
Turn in the 20 x/0.35 objective on the revolving nosepiece. Rotate the light ring drum so that the marking 200 appears on the top right hand side and ensure that the drum clicks into position.
Focus the microscopic image with the coarse and fine adjustment. Replace one of the eyepieces by the focusing magnifier. Rotate the eyelens of the focusing magnifier until the image of the light and phase ring appears sharp. Move the tilting object holder so that the light and phase rings are in precise register. After a change of magnification recentring of the light and phase rings is no longer necessary, but the correct setting of the light ring drum for the associated objective must be ensured.
Refocus with the fine adjustment. If observation in brightfield illumination is intended, the drum must be rotated so that it engages at the word "hell" on the top right-hand side. This setting applies to all magnification ranges in brightfield.
If during the observation of an object in phase contrast comparison with brightfield is desired, the lever 17.29 must be actuated. By pressure on this lever the phase contrast beam is modified to produce brightfield illumination suitable for general comparison purposes without the need to change the setting of the light ring drum. The observer is thus able to view a given object in phase contrast and in brightfield in rapid succession.

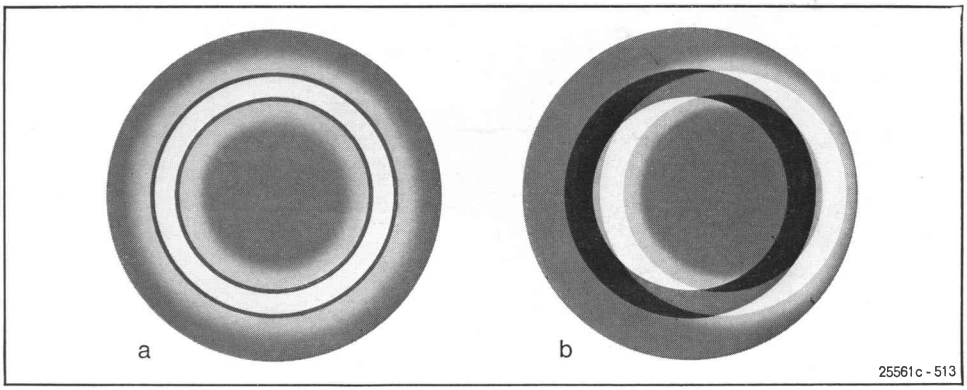

Fig. 18 a phase ring centred, b phase ring off centre

4.3 Investigations with the vertical illuminator for brightfield and darkground

The vertical illuminator for brightfield and darkground is used alternately for investigations in brightfield or darkground. One of the two types of illumination becomes effective when the central diaphragm 19.43 is swung into or out of the beam.

Remove the diaphragm tube from the upper light aperture. Insert the brightfield/darkground vertical illuminator in the horizontal changing guide according to Fig. 12 p. 12. Place the sample on the object stage. Switch on the illumination by means of the regulating knob of the transformer.

Turn out the darkground central stop (lever 43 points to the front as seen by the operator). Turn out the eyelens of the GW eyepieces until the marking rings become visible.

Focus the object. Close the field diaphragm until it just disappears beyond the rim of the field of view. Close the aperture diaphragm until good contrast becomes visible in the object while optimum resolution is still obtained.

To produce darkground illumination the central stop is turned in (lever 43 is at the rear stop). Fully open the field- and aperture diaphragms, i.e. the 2 levers on the tube are in a horizontal position. With darkground observation, slightly increase, if necessary, the brightness of the lamp with the regulating knob of the transformer. Any filters (e.g. for photomicrography) can be accommodated in the filter slot of the lamp housing. For further details consult Instructions No. 560-23.

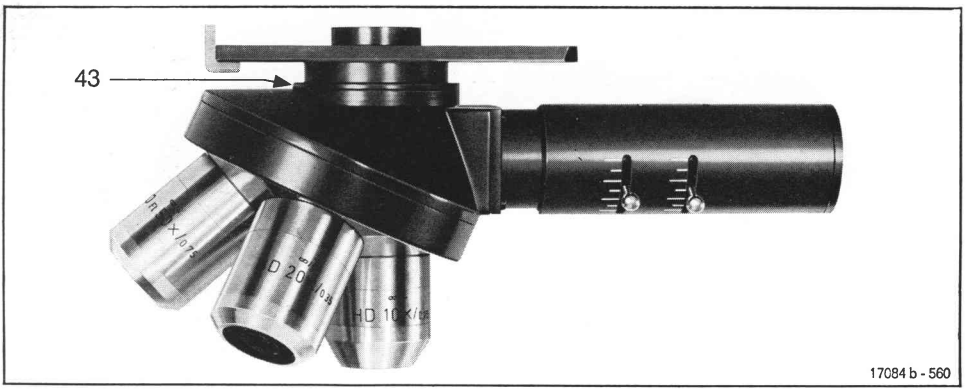

Fig. 19 Vertical illuminator for brightfield and darkground incident light

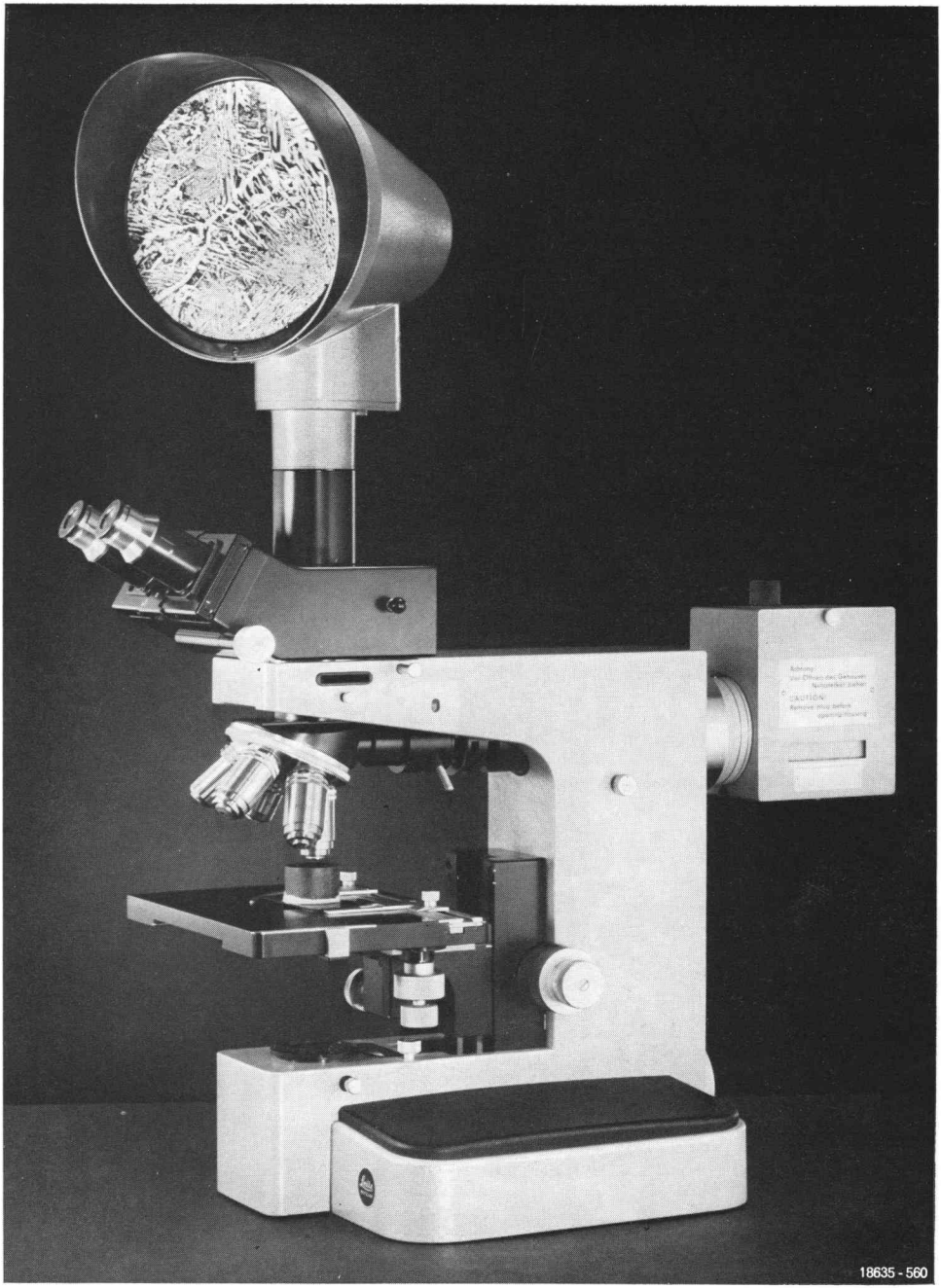

Fig. 20 METALLOPLAN with projection attachment

5 Vario tube

Although the Vario tube serves mainly for observation, it is also a valuable aid to 35mm photomicrography.

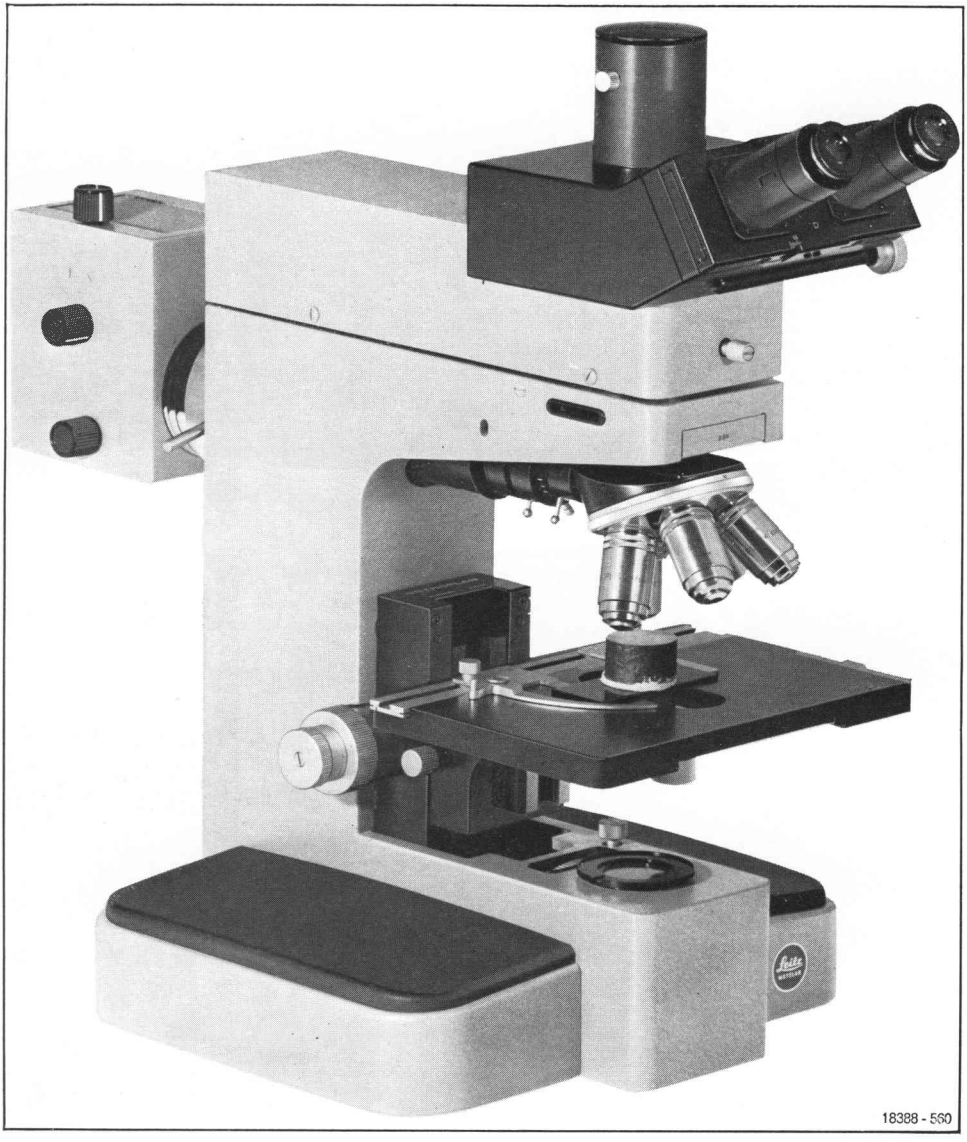

Fig. 21 METALLOPLAN with Vario tube

The desired magnification can be continuously set from 1 to 3.2 x with the knob on the right.

Attachment of the Vario tube

Depress the locking lever for the tube change, remove the FSA-GW tube from the stand and replace it by the Vario tube. Slowly release the locking lever and slightly pull it out. Now depress the locking lever on the Vario tube and place the FSA tube in position. Slowly release the locking lever.
Pull out the slide for the Bertrand lens as far as possible.
Set magnification "2 x" on the control knob on the right of the Vario tube. The Vario tube is now ready for operation. Focus the object in this "2 x" Vario position.
Instructions No. 513-115 contain detailed information on the use of the Vario tube.

The micro-hardness tester permits non-destructive hardness tests of polished metal as well as ore sections with test loads between 2 and 400 p.
The objective mounted in the indentor has a 50 x primary magnification and is best exchanged against the 80 x/0.95 objective in the revolving nosepiece. With the 10 x micrometer eyepiece a final magnification of 400 x is obtained with the 0.8 x tube factor.
The testing diamonds are interchangeable so that both the Vickers and the Knoop test can be performed. The Instructions Micro-hardness tester No. 560-21 R contain further information on the use and the evaluation of hardness indentations.

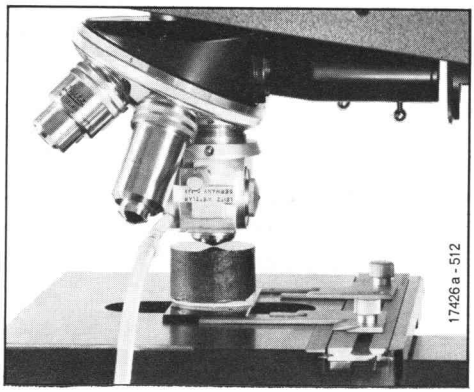

Fig. 22
Automatic micro-hardness tester

7 Photomicrography

General information

These instructions have been written for the correct use and operation of our microscope and its associated accessories. The operator is assumed to have a knowledge of photomicrography and microscopy; they are not an elementary guide.

We are therefore outlining only a few basic rules, which must be observed.

1. The exact plane position of the object.

2. Critical focusing of the image on the groundglass screen (large format) or in the eyepiece or focusing telescope (35mm).

3. The accurate determination of the exposure time.

4. Absolute cleanliness of all the optical surfaces accessible to the user, such as objective, tube lens, eyepiece etc. (See section Care and maintenance). Particular attention must be paid to the following points:

The useful magnification.

The choice of a light filter and of the suitable exposure material.

The following outfits are avaiable for photomicrography:

4 x 5in large-format camera

4 x 5in large-format camera with fully automatic exposure control

ORTHOMAT® fully automatic microscope camera

Micro-attachment for the LEICA® with vibration damper

System attachment camera

CB 100 Polaroid camera

7.1 4 x 5in large-format camera on the METALLOPLAN

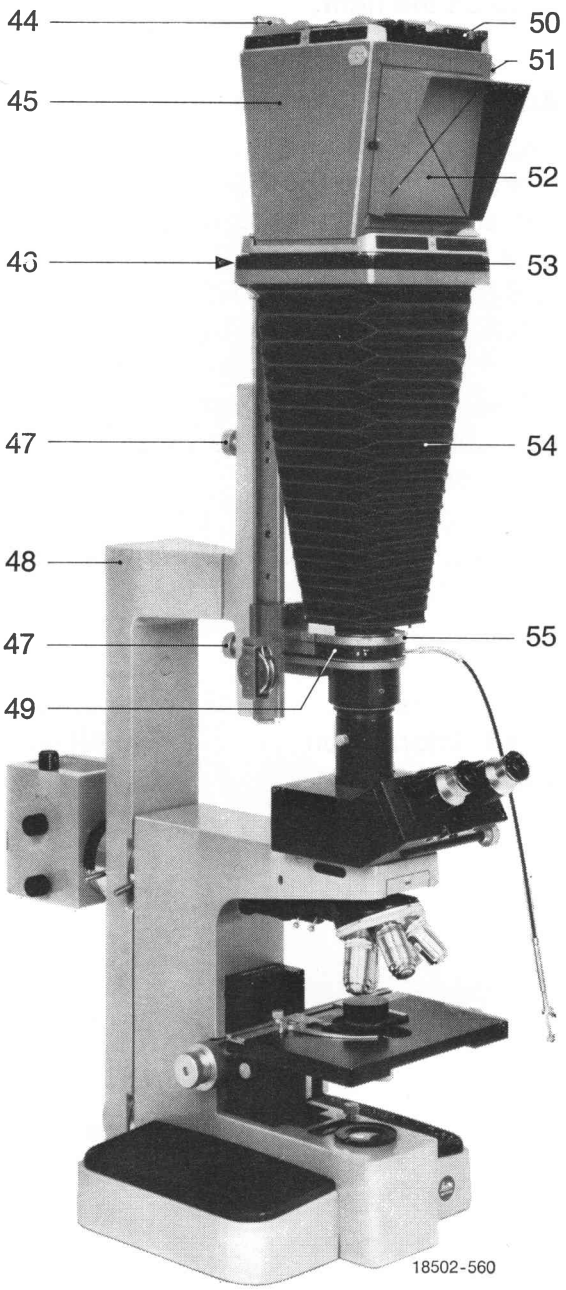

Fig. 23

44 Guide rail
45 Mirror reflex attachment
46 Clamping screw for the mirror reflex attachment (not visible in illustration)
47 Screws for fixing the guide rail
48 Camera carrier
49 Shutter support
50 Pressure frame and darkslide holder
51 Mirror tilting lever
52 Groundglass screen
53 Large-format camera with rotating darkslide frame
54 Bellows
55 Bellows lock

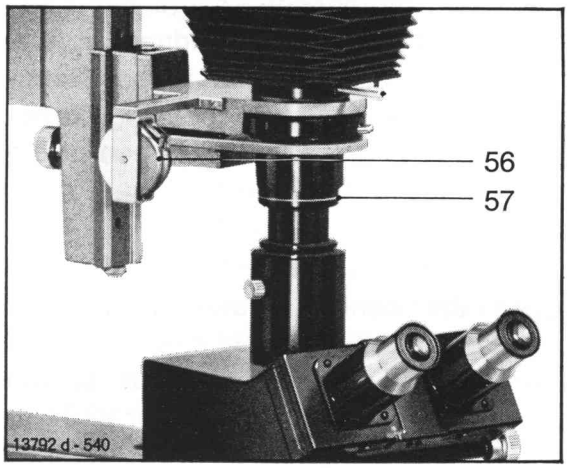

Fig. 24
Synchronized long-time and instantenous shutter
56 Tape measure
57 Marking ring for the lower light screening collar

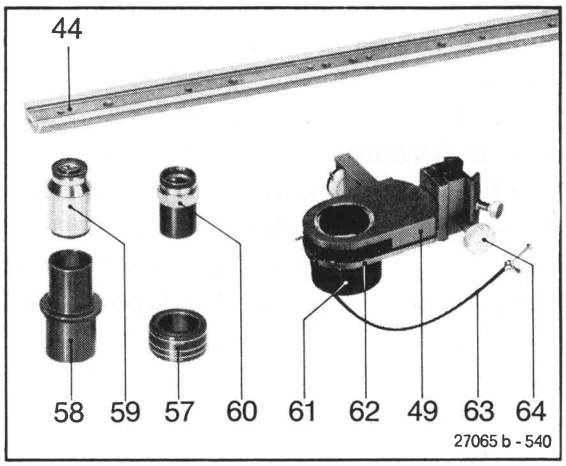

Fig. 25
Various parts for photomicrography with the 4 x 5in large-format camera.
Adapter for the photo tube for 30mm eyepieces, GW and GG eyepieces, shutter support, and upper light screening collar.
44 Guide rail
49 Shutter and bellows support
57 Lower light screening collar
58 Adapter for photo tube for GW and GG eyepiece
59 GW/GG eyepiece
60 Focusing magnifier
61 Upper light screening collar, screwed into the shutter and the bellows support
62 Shutter speed setting wheel
63 Cable release
64 Knurled screw for adjusting the shutter support

Attaching the 4 x 5in large-format camera

Remove the lamp housing from the stand. Connect the camera carrier 23.48 by means of the 2 bayonet locks with the stand; for this purpose push the lock downwards. Place the guide rail 23.44 on the camera carrier 23.48 and screw it in position with the two screws 23.47. Place the lower light screening collar 25.57 on the photo tube. Insert the eyepiece in the photo tube. Turn out the eyelens of the eyepiece until the engraved marking ring becomes visible.

Slide the shutter support 25.49 into the guide rail (upper light screening collar 25.61 pointing downwards) and lower it by hand or the knob 25.64 until the bottom edge of the upper light screening collar is flush with the corresponding marking on the lower light screening collar. With the GW 10 x eyepiece, for instance, it is the marking GW 10 x. See Fig. 24.

Clamp the shutter support on the guide rail.

Slide the large-format camera into the guide rail and clamp it in position with screw 23.46.

Lock the bellows of the large-format camera 23.55.

Screw the cable release into the threaded bush on the shutter support.

Replace the lamp housing.

7.2 Photomicrography with the 4 x 5in large-format camera

After the microscopic image has been adjusted in the observation tube and the area of the sample to be photographed found final focusing takes place on the groundglass screen of the mirror reflex attachment:

1. Set the setting wheel 25.62 at T and open the central shutter with cable release 25.63.

Turn in the deflecting mirror of the mirror reflex attachment, (lever 23.51 to the rear); if necessary readjust the lamp brightness*.

2. Set the desired picture area by vertical adjustment of the mirror reflex attachment after releasing the clamping screw 23.46. If necessary rotate the mirror reflex attachment to obtain the optimum picture area. The clamping screw must be retightened after the adjustment of the mirror reflex attachment.

3. Refocus the image on the groundglass screen 23.52 with the fine adjustment of the microscope.

Use the focusing magnifier.

First set the magnifier for your own eyesight: place it in the centre of the groundglass screen and focus it on the crosslines marked on the screen; do not move the eye too close to the magnifier.

4. Set the field diaphragm of the microscope so that it just disappears beyond the edge of the groundglass screen.

* for colour photography the colour temperature of the filament bulb must be matched with that for which the colour film has been sensitized.

The setting of the aperture diaphragm depends on the object and its structure.

5. The magnification on the groundglass screen can be determined as follows: first measure the bellows extension from the white ring on the light screening collar to the darkslide support with the tape measure 24.56. The magnification V is calculated according to the equation:

$$V = \frac{\text{objective magnification} \times \text{eyepiece magnification} \times \text{tube factor} \times \text{bellows extension in cm}}{25}$$

Example:

Objective magnification	8 x
Eyepiece magnification	8 x
Tube factor	0.8 x
Bellows extension	32cm

Least distance of comfortable vision to which all values are referred 25cm

$$V = 8 \times 8 \times 0.8 \frac{32}{25} = 65$$

With a stage micrometer the magnification can be determined more simply and accurately. The sample is replaced by the stage micrometer (1mm = 100 intervals). The graduation projected onto the groundglass screen is measured with a scale.

Example:

1 interval of the stage micrometer (0.01mm) = 10mm on the groundglass screen.

Image size:

Object size = 10:0.01 = 1000

The magnification therefore is 1000 x.

6. If necessary, insert photographic filters.

7. Insert the loaded darkslide between the pressure frame and the darkslide support.

8. Determine the shutter speed with the MICROSIX®-L exposure meter on the groundglass screen. See also instructions No. 540-21.

9. Turn in the deflecting mirror with lever 23.51.

10. Close the camera shutter with the cable release, set the shutter speed.

11. Pull out the slider of the darkslide so that it only just remains in its guide.

12. Expose.

13. Immediately close the darkslide and remove it or exchange it on the camera (exchangeable darkslide).

7.3 4 x 5in large-format camera with fully automatic exposure control

The 4 x 5in large-format camera with fully automatic exposure control is attached according to the directions given under section "4 x 5in large-format camera on the METALLOPLAN".
The only additional manipulation is the connection between the camera with automatic shutter and the control unit. Detailed information on the use of the 4 x 5in large-format camera with fully automatic exposure control will be found in the Instructions No. 540-29.

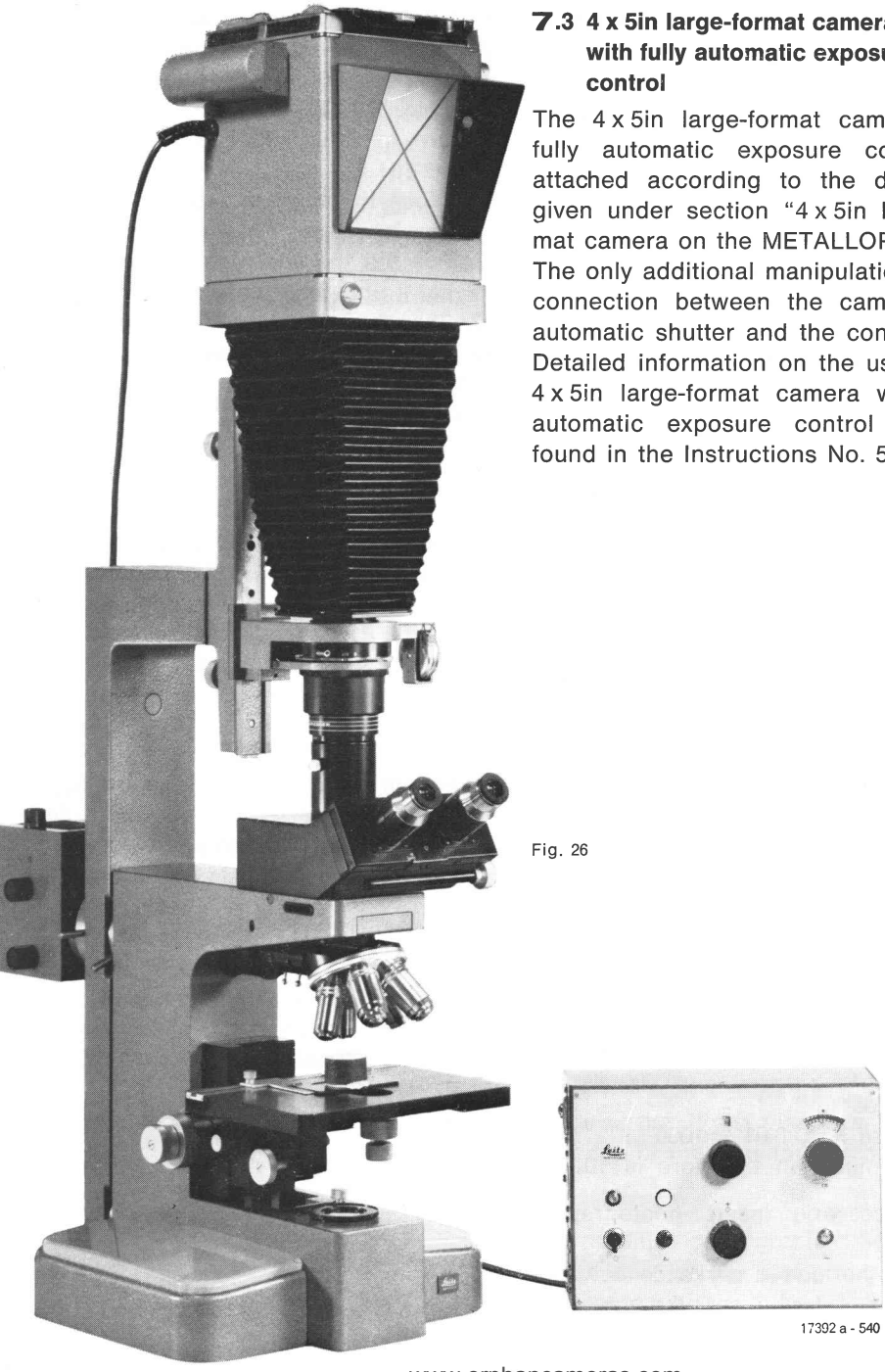

Fig. 26

17392 a - 540

7.4 METALLOPLAN with ORTHOMAT

Information on the operation of the ORTHOMAT® fully automatic microscope camera is contained in the separate Instructions No. 540-19.

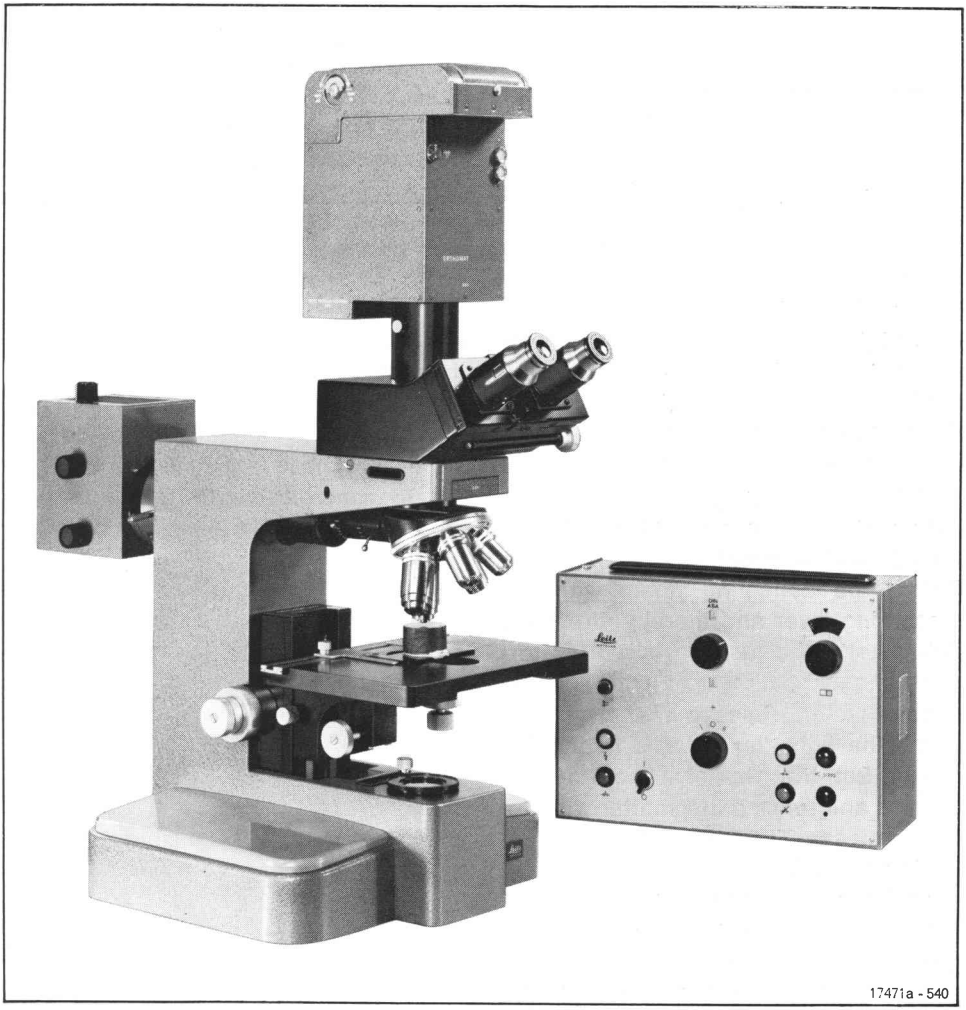

Fig. 27 METALLOPLAN with ORTHOMAT

7.5 Micro-attachment for the LEICA® with vibration damper

A vibration damper is incorporated in the top of the micro-attachment, which isolates the microscope from the unavoidable shutter bounce of the camera. In connection with the MICROSIX®-L exposure meter the exposure of small object details can be measured. The reading is taken of the central light bundle indicated by the inner double circle in the focusing telescope.

Sequence of operation

Insert the eyepiece tube in the photo tube and clamp it with the knurled screw. Insert the GF 10 x eyepiece. Push the micro-attachment onto the eyepiece tube as far as it will go and clamp it by means of the clamping screw. Mount the camera (red dot facing red dot).

Focus the double circle by adjusting the eyelens of the focusing telescope. Focus the object during simultaneous observation in the focusing telescope. Insert the measuring eye of the exposure meter in the measuring tube on the micro-attachment.

Switch the deflecting prism with the measuring lever and thereby direct the light flux to the measuring eye. Determine the exposure time with the exposure meter. Release the measuring lever (the light flux returns to the camera). Set the shutter speed on the camera and release the shutter with the cable release. Transport the film.

During work in bright light the focusing telescope must be protected against the entry of direct light during the exposure.

The Instructions No. 540-33 contain detailed information.

Fig. 28
Micro-attachment for the LEICA with anti-vibration damper

7.6 Attachment camera with CB 100 Polaroid back

For instant photography (Polaroid*) an attachment camera for the 8.5 x 10.5cm film format is available. The exposure material is Polaroid film pack type 107 (36 DIN, 3200 ASA) for black and white and type 108 (18 DIN, 50 ASA) for colour photography.

The flash-synchronized central shutter is supported by an anti-vibration mount and designed for time and instantaneous speeds from 1/125 to 1 sec. The image is focused in the FSA-GW tube. A 10 x eyepiece is mounted in the attachment camera; a PERIPLAN GF 12.5 x MF with a graticule outlining the picture area is used as a focusing eyepiece.

Sequence of operation

The GW eyepieces are replaced by GF 12.5 x eyepieces (one with graticule). Use the eyepiece adapters.

Insert the attachment camera in the photo tube and fix it in position with the knurled screw. Open the lock of the back and the camera back.

Insert the film pack in the camera.

Close the camera by slight pressure. Pull the black tab (protective cover) completely out of the camera.

A white tab now appears. The camera is ready for the exposure.

Determine the exposure time with the MICROSIX-L exposure meter.

(Calibration value 5.6). Set the shutter speed.

Focus the double circle in the centre of the image with the eyelens of the graticule eyepiece.

Focus the object.

Release the shutter with the cable release.

Pull the white tab straight and evenly out of the camera.

A yellow strip will appear in the upper aperture of the lid. This too must be pulled out of the camera straight and evenly. Development now begins. After 15 sec (type 108: 1 minute) separate the print from the rest of the paper. Black-and-white pictures must be fixed with the little glazing sponge included in the pack.

For further details see Instructions No. 540-34.

* Polaroid Corporation, Cambridge, Mass., USA.

Fig. 29
Attachment camera with CB 100 Polaroid back

8 Care and maintenance

After use the microscope should always be covered with a flexible dust cover. From time to time the stand should be cleaned with a piece of linen or chamois leather. Spirit must on no account be used, since it attacks the enamel.
Petrol, on the other hand, is eminently suitable for the cleaning of enamelled parts.
Bright patches on the object stage caused by petrol can be removed by treatment with liquid paraffin or acid-free vaseline.
The optical parts of the microscope must be kept scrupulously clean. It should, however, be borne in mind that for some internal surfaces of objectives, eyepieces and condensers very soft films are used for reducing reflections. The films with which external surfaces of the optical systems are coated have about the same hardness as glass. All these films are, however, extremely thin. They must therefore be cleaned with great care.
For cleaning objectives must not be dismantled. If damage becomes evident inside an optical system, this should be returned to the factory at Wetzlar for repair.

Care of optical systems

External surfaces of objectives, eyepieces, condensers	Dust: remove with soft dry sable brush. Finger marks: remove immediately with moist piece of linen or chamois leather; if necessary use chemically pure petrol. Resistant dirt: with moist piece of linen or chamois leather; if it resists treatment with water, petrol or xylene can be used for moistening the rag or chamois leather. Never use spirit.
External surfaces of front lenses of plano objectives	The external surfaces of the front lenses of some plano objectives are concave. It is best to clean them with a piece of cotton wool wrapped round a little wooden stick. Here, too, xylene or chemically pure petrol should be used instead of water if dirt is resistant.
Oil immersion objectives	clean immediately after use. Remove oil with blotting paper or a piece of linen. Remove the residual film of oil by means of a piece of linen soaked in xylene. Final cleaning if necessary with chemically pure petrol. Never use alcohol or spirits.

Hydrofluoric acid

This etching medium, frequently used in metallography, represents a considerable damage to optical systems, since especially in porous materials small but very corrosive concentrations of hydrofluoric acid collects. These can be removed quickly and reliably with the following method: place the etched object in a saturated solution of ammonium pentaborate for an hour. Now rinse it well in tap water and dry it.

Ammonium pentaborate has proved compatible with numerous metallic, ceramic, metalloid, and semi-conductor preparations in which etching with hydrofluoric acid is required.

The solution consists of 9.8g ammonium pentaborate dissolved in 100ml distilled water.

Magnification table

for the LEITZ METALLOPLAN
metallographic microscope
Tube factors 0.8 x ← 1 x → 1.25 x

Objective magnification	Final magnification with Huygens- or PERIPLAN eyepieces					
	6.3 x	8 x	10 x	12.5 x	16 x	25 x
2	12	16	20	25	32	50
3.2	20	25	32	40	50	80
5	32	40	50	63	80	125
8	50	63	80	100	125	160
10	63	80	100	125	160	250
16	80× 100	125	160	200	250	400
20	125	160	200	250	320	500
32	160× 200	250	320	400	500	800
50	320	400	500	630	800	1250
80	500	630	800	1000	1250	2000
100	630	800	1000	1250	1600	2500
160	1000	1250	1600	2000	2500	4000

The magnifications refer to the tube factor 1 x. The magnifications for the tube factors 0.8 x and 1.25 x will be found in the column to the left and to the right respectively of that for tube factor 1 x.

Appendix

Use of the eyepiece graticule according to Snyder-Graff

The eyepiece graticule Code No. 569 902 is designed for use with the PERIPLAN GF 10 x M eyepiece and 100 x objective, i.e. it is used for the 1000 x standard magnification. Here the mean number of the counted structural particles directly represents the Snyder-Graff number (SGN). If the graticule is used in other GF eyepieces and with other objectives the Snyder-Graff number will be the product of the particle number n obtained and a calibration factor k.

$$SGN = k \times n$$

The calibration factor is determined as follows:

The length d of the object distance marked by the crosslines (diameter of the circle around the point of intersection of the crosslines) is measured in μm units with the aid of a stage micrometer. The number 127 is divided by this number and k obtained.

Example:

measured value d = 163μm

$$\text{when } k = \frac{127}{163} = 0.78$$

$SGN = 0.78 \times n$

If the primary magnification of the objectives is higher than 100 x, k will be greater than I; if it is below 100 x k will be smaller than I. The Instructions 560-26 contain further details.