

Leitz

ULTROPAK

INSTRUCTIONS

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Instructions for the ULTROPAK® incident-light illuminator

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1 Introduction

The ULTROPAK is an incident-light illuminator functioning on the principle of darkfield illumination and permitting microscopic observation of any kind of surface. The total magnifications obtainable with the ULTROPAK are within the range of 32x-750x. It is used mainly in the following fields:

Biology:

Medicine (also intravital microscopy)

Botany

Zoology

Technology:

Crime detection

Textile research

Investigation of pigments, varnishes, and paper

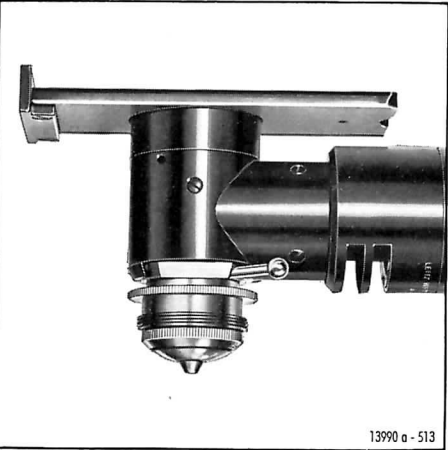
Ceramics

Metallurgy

Mineralogy, etc.



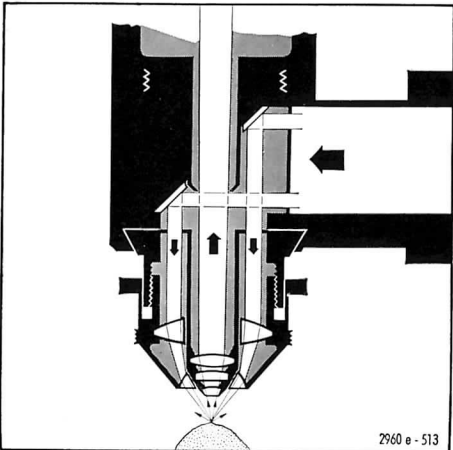
2 Technical description



ULTROPAK with bracket for the ORTHOPLAN

Tube with two slots for the filters, which are part of the outfit (diffusion disc, yellow-green filter, and conversion filter), and for the polarizing filter of the polarizing equipment.

Two sector stops can be inserted in the slots in order to obtain illumination from one side only.



Special mirror, with central aperture, inclined at 45°. The illuminating rays are directed to the illuminating system of the UO objective apart from the image-forming rays.

Illuminating system (annular condenser) of the UO objective. With the objective UO 4 the annular condenser is permanently adjusted. The annular condensers of all other objectives are adjustable. An orientating scale on the external mount makes a reproducible setting of the illuminating rays possible.

The following ULTROPAK objectives are available:

Designation of objectives		Free working distance in mm	Magnification with eyepiece tube factor 1.25 x			Outfit on request with
	Magnification/ Aperture		6.3 x	8 x	10 x	
Dry systems	UO 4/0.10	13.2	32	40	50	Immersion attachments 4 6.5 11
	UO 6.5/0.18	16.0	52	65	82	
	UO 11/0.25	5.7	90	110	140	
	UO 22/0.45	2.1	175	220	275	
	UO 32/0.55	1.0	250	320	400	
	UO 42/0.60	0.65	330	420	525	
Immersion objectives	UOW 55/0.80	0.59	440	550	690	Dipping cone EZ 23-100, including 50 coverglasses and 1 tube of Canada balsam
	UOI 60/0.85	0.38	480	600	750	

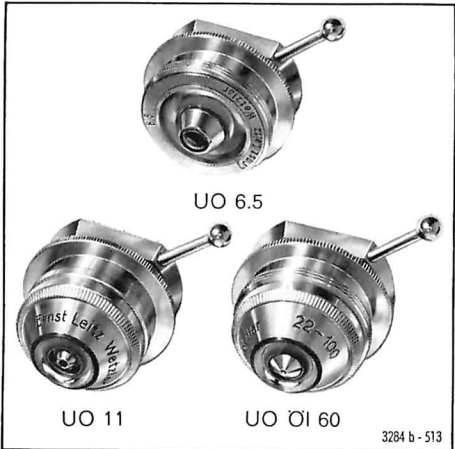
W = water immersion, OI = oil immersion

The long free working distances of the UO objectives permit the investigation of deep layers of microscope preparations. The objectives are listed in the table on p. 2.

The UO objectives are computed for a tube length of 185mm. This is due to the height of the illuminator. These objectives are therefore used on the ULTROPAK with an intermediate optical system specially computed for this purpose. The observation eyepiece tubes of all microscopes can therefore still be used.

Except the UO 42/0.60 the ULTROPAK objectives are corrected for use without coverglasses. However, they may also be used with coverglasses; this applies particularly to immersion systems.

The orientating scale (see illustration below) on the external mount of the UO objectives with adjustable annular condenser serves for the reproducible setting of the illuminating system. Before the image is focused the annular condensers must be set at the middle value of this scale. The optimum illumination of each object is achieved by means of raising or lowering these annular condensers.



Characteristic ULTROPAK objectives



ULTROPAK objective

3 Preparation for use

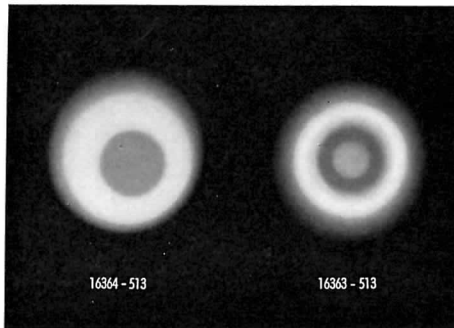
31 Adjusting the illumination

311 Centring the light source

ULTROPAK illumination requires perfect adjustment of the illuminating beam, with the light as evenly distributed as possible. Optimum illumination of the object is obtained as follows:

- 1) Mount the ULTROPAK without objective on the stand as described under 321-323.
- 2) Connect 6v 15W light source to transformer and switch on.
- 3) Form an image of the illuminating beam at the level of the object on a piece of white paper; check centration of the light source.

Centration of the light source



incorrect

correct

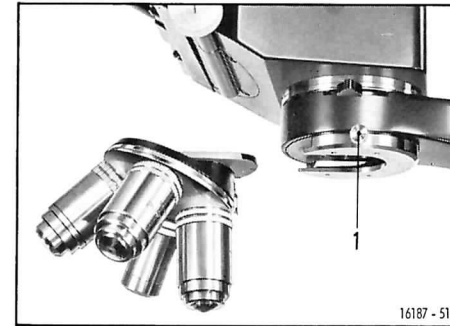
312 Source of error

If the light source is off-centre only one side of the microscopic image will be bright.

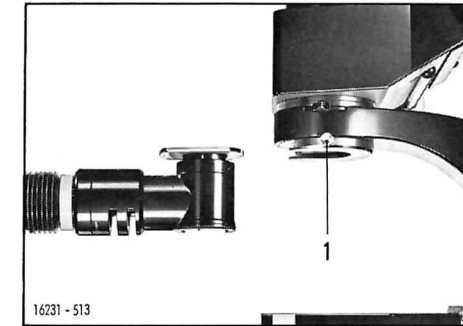
32 Microscopes suitable for the use of the ULTROPAK

The ULTROPAK can be used on the following LEITZ microscopes: LABORLUX®, ORTHOLUX®, ORTHOPLAN®, PAN-PHOT®, the Inverted Microscope, the Forensic Comparison Microscope, the Intravital Microscope, the UE top, and, in connection with the changing device, also the US II Pillar Stand.

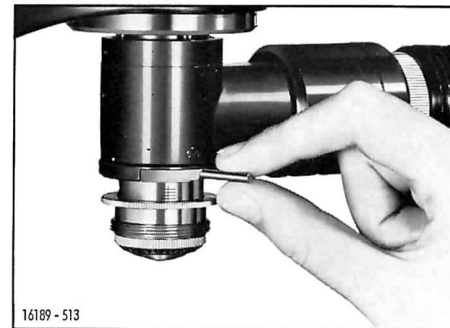
321 ULTROPAK and LABORLUX



- 1) Release clamping screw (1), and pull out objective nosepiece from the dovetail guide of the stand.

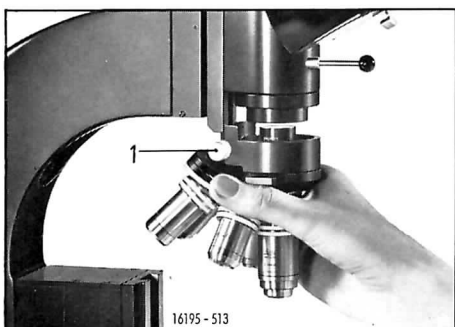


- 2) Insert ULTROPAK into the dovetail guide and tighten clamping screw (1).

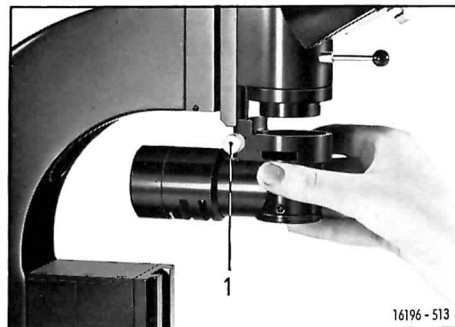


- 3) Connect the 6v 15W low-voltage lamp of the ULTROPAK to the transformer.
- 4) Centre the lamp according to the instructions 311.
- 5) Insert the ULTROPAK objective and focus the object.

322 ULTROPAK and ORTHOLUX

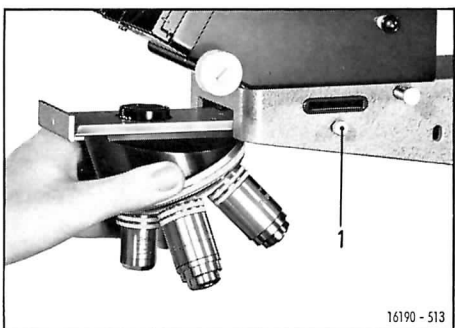


1) Release clamping screw (1), gently lower the revolving nosepiece and remove it from the stand.

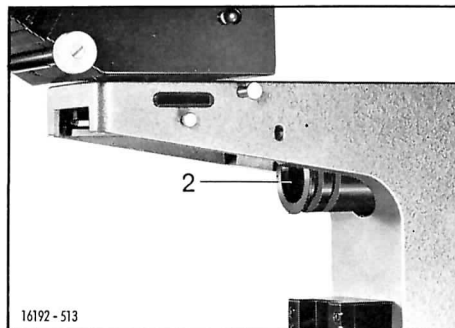


2) Insert the ULTROPAK fully in the dovetail guide. Tighten clamping screw (1).
3) Switch on and centre the light source according to instructions 311.
4) Insert the ULTROPAK objectives and focus the object.

323 ULTROPAK and ORTHOPLAN research microscope

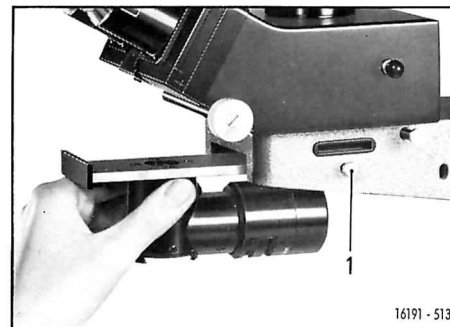


1) Release clamping screw (1), pull out the revolving nosepiece from the stand.



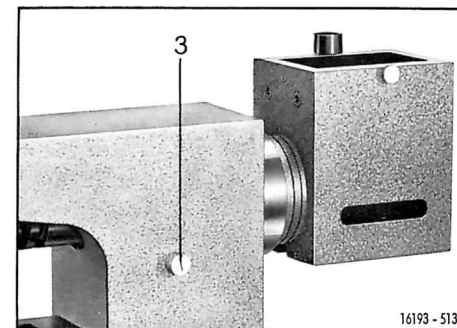
2) Insert light tube (2) into upper lamp opening.

324 ULTROPAK and PANPHOT camera microscope



3) Insert ULTROPAK fully into the dovetail guide. Tighten clamping screw (1).

The ULTROPAK is installed on the PANPHOT in exactly the same way as on the ORTHOLUX. With illumination by tungsten filament lamp the light source need not be centred. For the adjustment of special light sources please consult Operating Instructions 54-16.



ORTHOPLAN with lamp housing 100 Z.

325 The ULTROPAK on the Inverted Microscope and on the Forensic Comparison Microscope

Instructions for the use of the ULTROPAK on these microscopes are analogous with those described in the preceding paragraphs.

4) Switch on upper light source. Turn out swing-out lens (3).

5) Insert the ULTROPAK objective and focus the object.

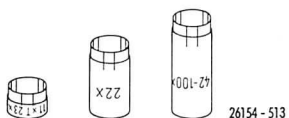
4 Accessories

41 Funnel stops for objectives,

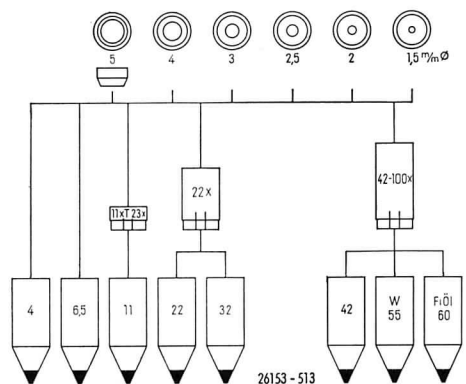
of various diameters, serve for increasing the depth of field of the UO objectives. Excessive stopping down should be avoided, since reduction of the objective aperture reduces resolving power and image brightness.



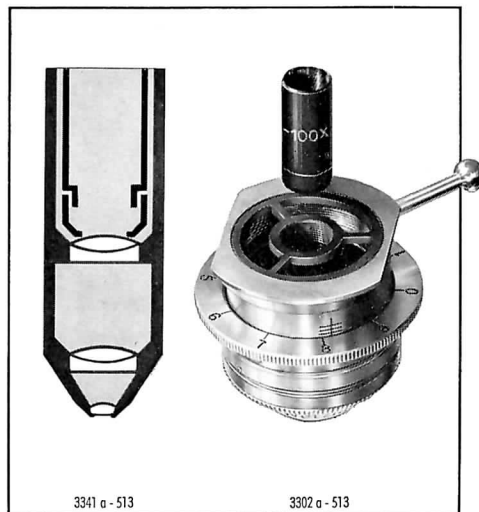
6 funnel stops, of 1.5, 2, 2.5, 3, 4, and 5mm diameter, are available. They are pushed onto a collar



according to the desired depth of field. As the illustration below shows, no collar is required for the UO 4 and UO 6.5 objectives.



Use of the funnel stops in the various UO objectives



Insertion of the funnel stop in the objective fitting

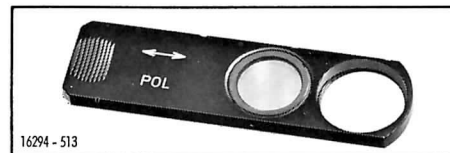
42 Polarizing device

for orientating observations in polarized light and the reduction of surface reflections

It consists of:

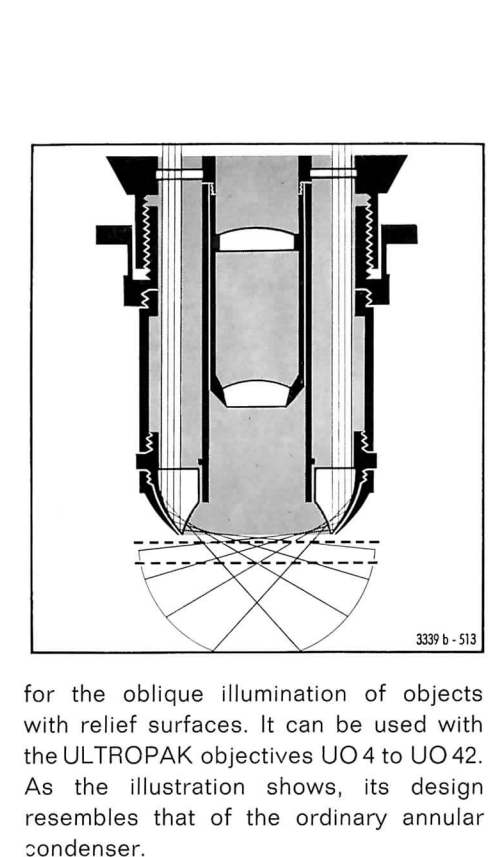


Polarizer for insertion in the filter slots in the ULTROPAK collar. The wide cut-outs in the collar permit a rotation of the polarizer through 90°.



Analyser, for insertion in the angle piece of the microscope (here: the ORTHOLUX).

43 Relief condenser



for the oblique illumination of objects with relief surfaces. It can be used with the ULTROPAK objectives UO 4 to UO 42. As the illustration shows, its design resembles that of the ordinary annular condenser.

431 The relief condenser consists of the following components:



① Special changing adapter



② ULTROPAK objective



③ Collar for the elimination of stray light



④ Extension collar for the vertical adjustment of the condenser unit



⑤ Condenser unit

432 The following points should be observed during the assembly of the relief condenser:

- 1) Screw the UO objective ② into the special changing adapter ①
- 2) Slide the appropriate anti-stray-light collar ③ over the objective ②
- 3) Screw extension collar ④ into the special changing adapter ①
- 4) Screw condenser unit ⑤ into extension collar ④
- 5) Lock relief condenser into the ULTROPAK.

The optimum setting of the relief condenser is determined as with the ordinary annular condenser by rotation of the setting ring on the special changing adapter ①.

433 Source of error

Disturbing reflections on the surface of the object can be reduced or eliminated by means of the polarizing device.

44 Mirror condenser

441 Technical description

The mirror condenser supplements the relief condenser in the range of high magnifications (from UO 22 upwards).



45 Immersion attachments

451 Technical description

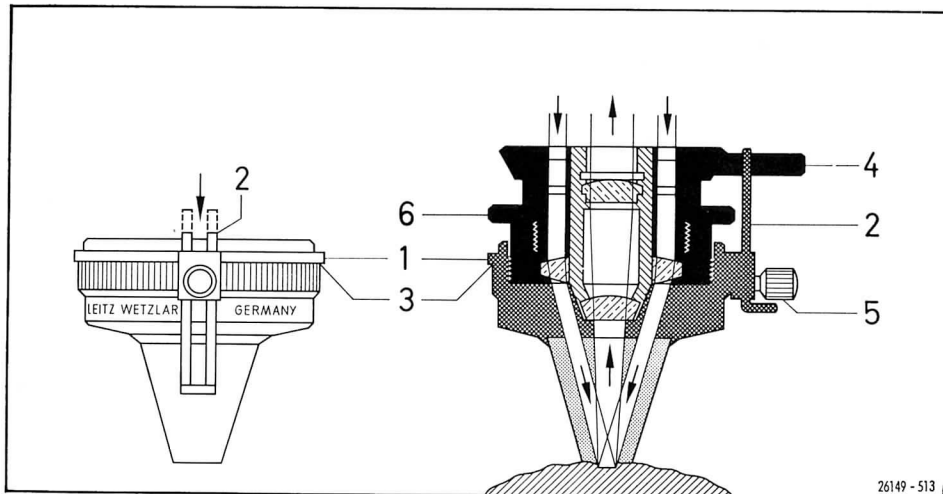
Immersion attachments must be used for the investigation of biological objects with a moist or greasy surface (fishes, parts of organs, etc.) in combination with the ULTROPAK objectives UO 4, UO 6.5, and UO 11. They eliminate disturbing reflections which may occur on objects with a predominantly uneven and shiny surface because of the oblique annular illumination. Covering the object with a coverglass is not advisable, especially with low-power dry objectives, since direct reflections would be caused on the glass surfaces. Also, dirt on the coverglasses, which are difficult to clean, could be so strongly illuminated as to affect observation adversely.

Furthermore, the immersion attachments are suitable for the examination of objects submerged in liquids (e. g. aquatic animals), whereby surface reflections are eliminated. Without the immersion attachment the image would be disturbed by reflections on the surface of the liquid.

442 Practical hints

With the mirror condenser the anti-stray-light collars and the extension rings as they are used with the relief condenser are not required. The UO objectives are screwed straight into the mirror condenser. The illumination must be chosen exactly as for the relief condenser, so that the object receives, according to its structure, diffused light from one side.

452 The following points should be observed during the assembly of the immersion attachments:



1) Set the annular condenser of the objectives UO 6.5 and UO 11 for optimum illumination (condenser position approximately in the middle). Since in the UO 4 objective the annular condenser is not adjustable, this procedure is omitted here.

2) The two plane-parallel surfaces through which the light passes should be thoroughly cleaned before the immersion attachment is screwed on to the annular condenser. Dirt particles on immersion attachments flare up and impair the brilliance of the image.

3) Release clamping screw ⑤ and push the guide fork ② back in the direction of the arrow. Turn the threaded ring ① until it lightly makes contact with the immersion attachment ③.

4) Screw the immersion attachment on to the external thread of the annular condenser ⑥, until the glass cone of the immersion attachment makes light contact with the front lens of the UO objective.

5) Slightly turn the glass cone away from the objective and apply immersion fluid to the top surface of the immersion attachment. Lock the objective and immersion attachment with the ULTROPAK. Focus the object, and move the immersion attachment further away from the objective by an anti-clockwise turn; determine the optimum position, continuously observing the microscopic image.

6) Set guide fork ② (not incorporated in the UO 4 objective) opposite the handle ④; push fork 2 over handle ④. Tighten clamping screw ⑤. Thus the annular condenser can be adjusted independently of the immersion attachment.

453 Sources of error

4531 Reflections in the microscopic image

Any reflections still present in the microscopic image may be due to incomplete immersion. It is therefore necessary first to examine the immersion fluid for even distribution and, if required, to add to it. Any persisting direct reflections from the object, such as highlights, can be reduced only with the polarizing device (see 42).

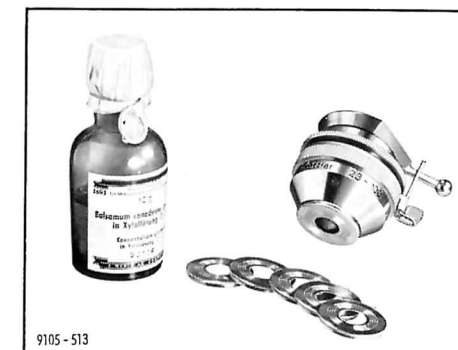
461 Technical description

Immersion caps hold the specimen flat or immobile it (e. g. pulsations in living animals). They are provided only for immersion objectives such as the UO W 55/0.80 and UO OI 60/0.85, therefore supplementing the immersion attachments (only for UO dry objectives up to UO 11). In addition, the immersion cap constitutes an effective object safeguard during investigations of infectious material; it can easily be sterilized.

Each immersion cap is supplied with 6 interchangeable coverglass carriers (see illustration below). The coverglasses included with the outfit range from about 0.15mm to 0.30mm in thickness. Whereas the thicker ones are to be used with immersion systems of medium magnification, the thin ones should be used with the high powers.

4532 Dirt on the plane-parallel surfaces of the cone

As already pointed out under 452, other disturbances of the microscopic image may be due to dust particles on the two plane-parallel surfaces of the cone. Although only a blurred image of the dust particles is formed if they are in the image-forming ray, they will cause reflexes because they are also in the illuminating ray, and make the microscopic image appear flat.



462 Practical hints

The following points should be observed during the use of the immersion cap.

1) Clean the coverglasses and keep them ready under a protective glass dish.

2) Cement the clean coverglasses to the interchangeable coverglass carriers by means of Canada Balsam dissolved in xylene (ratio 1 : 2).

It is best to apply this solution circularly with a little rod to the grooved profile of the coverglass. This is the only method of avoiding uneven distribution of the solution on the support surface of the carrier and its oozing out of it.

3) Set the annular condenser of the UO immersion objective without immersion cap for optimum illumination (about middle position).

4) Screw the threaded ring ① to the immersion cap ③ until it makes light contact with it. Release clamping screw ⑤ and push back guide fork ② in the direction of the arrow.

5) Screw the coverglass carrier ⑦ with the coverglass cemented to it on to the immersion cap.

6) Screw the immersion cap with coverglass, but without immersion fluid, carefully on to the external thread of the annular condenser, holding the graduated ring ⑥ in position, until the cemented coverglass touches the front lens of the objective. This can be easily seen if the mirror image in the coverglass is observed; the image becomes distorted as soon as the objective touches the coverglass.

7) Observing the mirror in the coverglass, turn the immersion cap back until the coverglass is just free of it.

8) Holding the immersion cap in position, turn the threaded ring ① to the right until the guide fork ② is above the handle ④. Push guide fork ② over handle ④ and slightly tighten clamping screw ⑤.

9) Unscrew the coverglass carrier ⑦. Apply a drop of immersion fluid to establish the connection between the objective and the coverglass, and replace the coverglass carrier ⑦. Attach objective with immersion cap to the ULTROPAK and lock it in position.

10) Release clamping screw ⑤ and increase the distance between immersion cap with coverglass and the objective until the front surface of the coverglass becomes visible in the microscope. In order to flatten the object the coverglass should now be slightly raised until the image of the coverglass front surface just disappears.

The fluid (liquid paraffin, glycerin, water, etc.) most suitable for the object to be investigated should be used between the coverglass and the object.

11) Rotate the immersion cap until it is adjusted for the object, with continuous observation in the microscope. Set the optimum image by tightening the clamping screw ⑤. The illumination can now be readjusted at will on the graduated ring ⑥ without any change in the distance between object, coverglass, and objective. During work with the immersion cap the coverglass surfaces will at first never appear quite clean. After application of the immersion fluid the most disturbing blemishes will disappear.

463 Sources of error

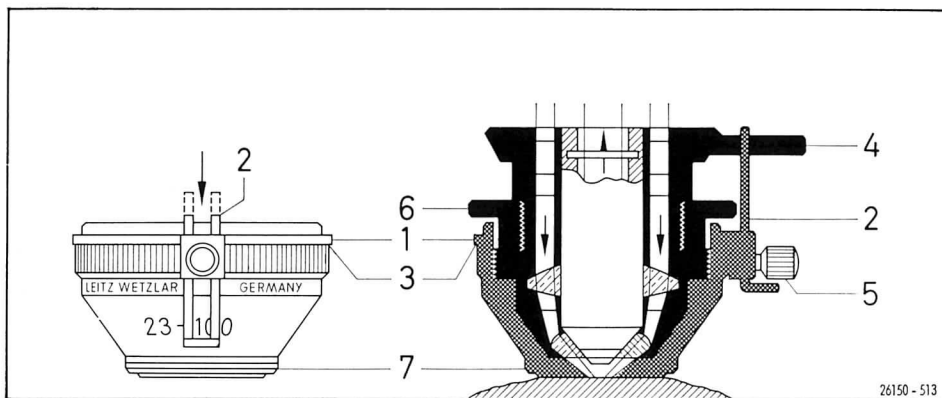
Reflections occurring during the use of immersion caps can have various causes:

a) dirt on the coverglass

b) incomplete union between immersion fluid and coverglass

c) air bubbles or dust particles between the objective and the coverglass.

These blemishes sometimes spoil the microscope image completely. Since generally the coverglasses are very difficult to clean perfectly, slight reflections must always be accepted during the use of coverglasses. These imperfections, which occur particularly with large-aperture, high-power objectives, can be considerably reduced by the use of funnel stops in the objectives. With water immersion, the drop of water between objective and coverglass should be large enough to prevent evaporation. For prolonged work with the immersion cap, an oil immersion objective is therefore preferable.



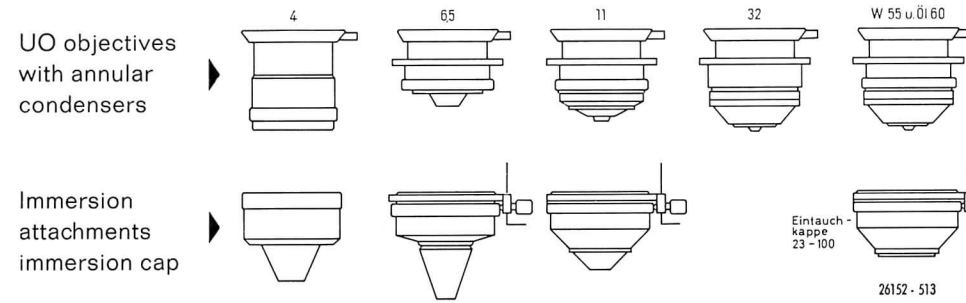
5 Care and Maintenance

47 Object slides

With dry or liquid objects which are smaller than the field of view of the microscope, the special ULTROPAK object slides made of polished black glass should always be used, since with ordinary transmitted-light slides the image is adversely affected by light from below, and is in danger of becoming flat because of light reflected into the objective.

The ULTROPAK is maintenance-free but should be protected from dust when stored. This also applies to the UO objectives.

Possibilities of combining the accessories of the ULTROPAK



Relief condenser

Changing adapter

UO objectives

Collars for the elimination of stray light

Extension collars

Condenser unit

Mirror condenser

UO objectives

Condenser unit

