DIAVERT
Inverted Microscope

Instructions

DIAVERT
Inverted Microscope

Instructions

1 Technical description
2 Unpacking the microscope
3 Assembling the microscope
32 Brightfield/darkground and phase-contrast condenser
33 Inserting the 6 V 15 W illuminator
34 Centring the 6 V 15 W illuminator
35 Inserting the 12 V 50 W tungsten halogen lamp
36 Centring the 12 V 50 W tungsten halogen lamp
4 Terminal tube
41 Binocular tube S
42 Binocular tube FSA
43 Objective revolving nosepiece
44 Coarse operation
45 Objectives
46 Eyepieces
47 Condenser
5 Operation
51 Observation with the condenser No. 01 for low magnification
52 Observation with the Darkfield condenser
53 Investigations in phase contrast according to Zernike
531 Phase contrast device with the condenser No. 01 for low magnification
532 Phase contrast device with the Darkfield AO condenser
54 ULTROPAK® incident-light illuminator
55 Darkground investigations
56 Photomicrography
6 Care and maintenance

1 Technical description

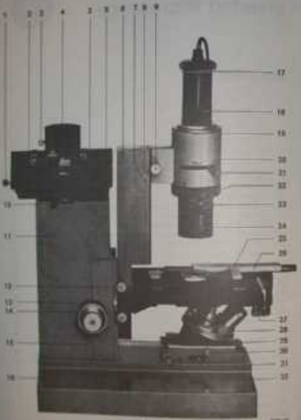


Fig. 1

1 [illegible]
2 [illegible]
3 [illegible]
4 [illegible]
5 Main tube
6 [illegible]
7 [illegible]
8 [illegible]
9 [illegible]
10 [illegible]
11 [illegible]
12 [illegible]
13 [illegible]
14 [illegible]
15 [illegible]
16 [illegible]
17 [illegible]
18 [illegible]
19 Lamp mount
20 [illegible]
21 [illegible]
22 [illegible]
23 [illegible]
24 [illegible]
25 Object stage
26 Revolving nosepiece with objectives
27 [illegible]
28 [illegible]
29 [illegible]
30 [illegible]
31 Specimen slide
32 [illegible]

2 Unpacking the microscope

The following parts are packed in a special container:

1) Microscope stand
2) Microscope tube
3) Object stage
4) Illuminator holder with lamp mount
5) KV 15 W illuminator or Lamp Housing 50
6) Revolving nosepiece
7) Individual parts such as objectives, eyepieces, condenser, dust cover, as well as transformer and other [illegible] accessories are packed separately.

All contact with the lenses of the objectives and eyepieces should, if possible, be avoided. Any finger marks on glass surfaces should be at once removed with a soft chamois leather or linen rag. Even minor traces of finger perspiration may rapidly attack the surface of high-quality optical glass.

Check the unpacked equipment [illegible] with the packing note and ensure that no components are left behind in the packing material.

The microscope should be used in a room free from dust, oil fumes and chemical vapours which may attack optical and mechanical parts. In addition it should not be subject to major temperature fluctuations and vibration. The components housed inside the stand are completely sealed off against external influences.

The mains connection of the transformer should be fused for 10 amp.

2 Assembling the microscope

2* [illegible] with condenser No. [illegible] for low magnifications

[illegible] the coarse focusing control until the stage changing guide is in the lowest position.
Release clamping screw 2.11 (Fig. 2, [illegible]), insert the object stage into the changing guide and lower it until the [illegible] marking 2.32 [illegible] the 2.34. Fix the stage with clamping screw 2.11.

The markings indicate:
L = Long working distance
NL = Normal working distance
[illegible] = [illegible]
[illegible] = Vertical illumination with objectives + [illegible] adjustment length

Fig. 2 [illegible]

Release clamping screw 2.12, insert the illuminator holder 2.6 in the changing guide and lower it to the stop onto the stage bracket. Fix clamping screw 2.12.

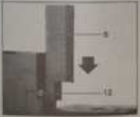


Fig. 3 [illegible]

Release clamping screw 4.6 and insert the lamp mounting into the changing guide from above; [illegible] to the figure marking 1 (4.7) and clamp it with clamping screw 4.6.

Insert the [illegible] illuminator or Lamp Housing [illegible] in the bayonet ring of the lamp mount and lock it by turning it clockwise. Fix the lamp cable on the cable holder and connect it to the [illegible]. Screw the condenser No. [illegible] into the lamp mount.

Fig. 4 [illegible]

Fig. 5 [illegible]

Fig. 6 [illegible]

Fig. 7 [illegible]

Push the locking lever 8.19 to the right. Insert the tube vertically and release the locking lever. In this position it must be possible to rotate the tube without effort. It is arrested by short pressure on the locking lever to the left.
Unscrew the clamping screw 8.32 and swivel the revolving-nosepiece fitting 8.28. Raise the object stage by means of the coarse adjustment 1.13. Push the revolving nosepiece 10.28, with objectives screwed in position, into the fitting in the stop. Fix the objective revolving nosepiece with arresting screw 10.30.
Swing the revolving nosepiece fitting in again and fix it by means of the arresting screw 11.32.
The attachable object guide can be attached to the object stage from 2 sides. Place the attachable object guide on to the object stage in the desired position and push it into the recesses provided there. Fix it with the knurled screws 12.36.
Insert the object holder into the object guide from the front, ensuring that the recessed side of the object holder is to the rear and the milled slots on top. The object holder clamps must engage. Connect the board with the transformer by means of the connecting cable and the transformer to the mains.

Fig. 8 Mounting the binocular tube 2
19 Locking lever

Fig. 9 Mounting the revolving nosepiece fitting
20 Revolving fitting for the revolving nosepiece
22 Arresting screw for the revolving nosepiece fitting

Fig. 10 Inserting the objective revolving nosepiece
28 Revolving nosepiece
30 Clamping screw for revolving nosepiece

Fig. 11 Turning in of the revolving nosepiece fitting
32 Arresting screw

Fig. 12 Attaching the object guide
36 Knurled screws for fixing the object guide

Fig. 13 Inserting the object holder

3.7 Work with Series 602 brightfield condensers, Series 406 phase contrast condensers and darkground condenser D 0.80–0.95 and D 1.20–1.40

The object stage and the illuminator holder are inserted according to Figs. 3 and 4.

Unscrew the clamping screw 14.37 and insert the condenser fitting 14.36 with lock changer in the changing guide from above and lower it to the stop. Tighten clamping screw 14.37.

Insert the condenser in the lock changer to the stop. The swing-out lens 15.38 points downwards.

Unscrew clamping screw 18.8, insert the lamp mount in the changing guide from above, lower it to the figure marking 7 (18.8) and clamp it. Only with condenser top of long intercept distance 1 otherwise figure 1.

The tube, object carrier and object guide are inserted according to directions pp. 6–7.

3.8 Inserting the XV 15 W lamp

The lamp is changed as follows:

1) Unscrew the clamping screw 17.39 and pull out the lamp mount.

2) Take lamp 17.50 out (push new lamp into the socket 17.51 and turn it anti-clockwise for clamping).

3) Precentred or non-centred lamps can be used.

a) Insert a precentred lamp so that the slot of the lamp comes to lie below the red slot of the lamp socket.

b) Insert the non-centred lamp into the guide grooves of the socket with the two pins and lock it in position by pushing it in to the right.

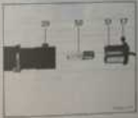
Insert the Lamp Housing 16 in the bayonet mount and lock it in position.

3.9 Centring the XV 15 W

Insert the centring disc in the aperture of the object stage. Completely open the aperture diaphragm. Adjust the lamp socket 17.51 until the light point appears sharply on the centring disc.

By adjusting the two centring screws 17.17 move the light points into the centre of the centring disc.

After removal of the centring disc adjust the lamp socket until the rear focal plane of the objective is evenly illuminated.



[illegible] Inserting the 12 V 50 W tungsten halogen lamp

Unscrew the knurled screw [illegible] from the Lamp Housing 50 and remove the socket from the housing.
Insert the 12 V 50 W lamp with protective sleeve in the socket and remove protective sleeve.
Insert the socket on the holder and [illegible] engage. Tighten the knurled screw.

Fig. [illegible] Inserting the 12 V 50 W lamp in the Lamp Housing [illegible]
[illegible]

Fig. [illegible] [illegible] the Lamp Housing 50 [illegible]

[illegible] Centring the 12 V 50 W tungsten halogen lamp in the Lamp Housing 50

After each change of lamp, the tungsten halogen lamp must be recentred.
Completely open the aperture diaphragm. Insert the centring disc in the stage aperture.

a) Focus the mirror image of the lamp filament by adjusting the reflector [illegible]. Form an image and a mirror image of the lamp filament on the centring disc by rotating ring [illegible].

b) Move the image and mirror image of the filament into the centre by adjusting knob [illegible].

c) Turn knob [illegible] for the vertical adjustment of the lamp until the image and mirror image of the filament overlap along the edges.

Remove the centring disc and replace it by the specimen.

Rotate the lamp condenser, simultaneously observing the rear focal plane of the objective (removal of the eyepiece from the eyepiece tube) until the focal plane is evenly illuminated.

Fig. [illegible] Lamp Housing 50
[illegible]

Fig. [illegible] Centring the tungsten halogen lamp

4 Technical hints

4.1 Binocular tube S

The tube can be set for the individual interpupillary distance of the observer. This requires a corresponding correction of the tube length, which is carried out on the eyepiece tubes as follows: set the interpupillary distance by pushing or pulling with both hands so that the 2 part-images coincide in the principle: thus only a single circular image is seen. Read the interpupillary distance on the scale engraved in the front plate of the tube and transfer it to the two eyepiece tubes.

Fig. 12 Binocular tube S

4.2 Binocular tube FSA

The binocular tube FSA has a hinged beam-splitting prism, which either splits the light intensity in a ratio of 80:20 (80% for photography, 20% for visual observation) or directs the entire light flux into the eyepiece tubes (for visual observation). The interpupillary distance is set on the tube with both hands by simply pulling or pushing.

If the interpupillary distance is not known, the tube is adjusted during binocular observation until only a single, circular and easily surveyed field of view appears. Corrections of visual defects must be carried out with the aid of the focusing eyepiece or one of the two PERIPLAN eyepieces.

4.3 Objective revolving nosepiece

The revolving nosepiece has 5 numbered threads for the objectives. An objective/eyepiece chart accompanies every outfit. It indicates, amongst other data, the nosepiece threads to which the individual objectives are matched.

4.4 2-knob operation

The fine adjustment is operative for about 2 turns, and then actuates the mechanism of the coarse adjustment. When the rotating direction is reversed, fine adjustment will automatically be re-engaged. One dial division of the fine adjustment corresponds to about 2 µm.

4.5 Objectives

The data engraved on the microscope objectives used in the LEITZ system indicate:

170

distance in mm from the flange of the objective to the rim of the tube (mechanical tube length).

0.17

is the coverglass thickness to be used in mm. Instead of the figure 0.17 a dash may appear, which means that with these objectives specimens can be observed with or without coverglass.

Below the tube length and coverglass thickness indication the reproduction ratio (dimensionless ratio of intermediate image) and the numerical aperture of the objective 10/0.30 are engraved in abbreviated form.

In addition the state of correction is also given: Pl = fluorite system, Apo = apochromat, NPl = normal plane objective and Pl = plane objective. Objectives without letters of designation are achromats. Objectives for phase contrast are engraved "Phaco".

Immersion objectives have the word "Oel" and a black ring engraved on the mount.

The letter L indicates long working distance.

The following objectives can be used with the condenser No. 31 (aperture 0.90):

Objective		[illegible]	[illegible]	Phase contrast [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
Phaco	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Phaco	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Phaco	[illegible]	[illegible]	[illegible]	[illegible]

For work with histological sections, smear preparations and generally with a coverglass of 0.17 mm thickness all LEITZ transmitted-light objectives right up to oil immersion can be used.

Here the use of a Series 600 condenser is recommended. For phase contrast investigations a Series 600 condenser is used. Ensure that the supplementary lens is inserted in the 600 or 800 Series condenser.

4.6 Eyepieces

Eyepieces of field-of-view index 18mm can be used in the DIAVERT tube. It the diameter of the field of view in is divided by the objective magnification the diameter of the object area to be surveyed is obtained.

Field of view index / Objective magnification × tube factor

PERIPLAN® eyepieces (dia. 23.2mm)	
Magnification	Field of view
6.3 x	18
6.3 x M	18
8 x	18
10 x [1]	14
20 x	8
High-point eyepieces	
8 x	18
10 x	18
10 x M	18
10 x MF [1]	18
Graticule: 10mm = 100 intervals	

[illegible]

Widefield eyepieces PERIPLAN MF/GF (dia. 23.2mm)	
Magnification	Field of view
MF 10 x	18
MF 10 x M	18
GF 10 x	18
GF 10 x M	18
GF 12.5 x	18
GF 12.5 x M	18
GF 12.5 x MF [1]	18
GF 16 x	16
GF 25 x	10
GF 25 x M	10
Graticule: 10mm = 100 intervals	

[illegible]

Special eyepieces (dia. 23.2mm)	
Magnification	Description
P 6.3 x	Pointer eyepiece
H 8 x	Double pointer eyepiece
P 10 x [1]	Eyepiece with fixed pointer (* engraved in yellow)
MF 10 x [1]	Eyepiece with fixed pointer (* engraved in yellow)
GF 10 x [1]	Eyepiece with fixed pointer (* engraved in yellow)
P 10 x	Comparison eyepiece
GF 10 x	Eyepiece for photomicrography (red dot engraved)
12.5 x	Screw micrometer eyepiece
12.5 x	Screw micrometer eyepiece for monochromatic light

4.7 Condensers on the DIAVERT

When the condenser No. 51 of long working distance is used a simple method of illumination is realized. Here the condenser is arranged so that with optimum lamp centration even illumination of the microscopic image is ensured. The iris diaphragm of the holder serves as aperture diaphragm. Depth of field (axial resolving power) and contrast of the microscopic image can be changed with it. In most cases best results are obtained if the field aperture and objective aperture have a ratio of 2:3, i.e. if about 2/3 of the diameter of the rear focal plane of the objective is illuminated. This can easily be checked when the eyepiece is removed from the eyepiece tube. More drastic stopping down may result in noticeable diffraction effects and adversely affect the quality of the image.

With the system condenser (Series 400 and 600) Köhler's method of illumination is used. Here the iris diaphragm built into the lamp mount serves as the field diaphragm. When the condenser is correctly set (see p. 20) a sharp image of the diaphragm is formed in the object plane. Referred to the size of the microscopic image field, the field diaphragm limits the ray cone in the object. Only the bundle of rays required for the formation of the image will reach the objective. This avoids a degradation of the image owing to flare, loss of contrast and disturbing reflections. At the same time unnecessary heating of the specimen is prevented.

The achromatic system condensers of Series 600 consist of a standard base No. 600 with condenser tops which is the condenser for low powers. The aperture diaphragm for the [illegible] condenser and interchangeable condenser tops of various [illegible] [illegible] distances and apertures. The condenser top can be swung out of the beam. The condensers are interchangeable in a horizontal dovetail guide and can be vertically adjusted by means of a rack and pinion.

Brightfield condenser system 6/8

Phase contrast condenser system 6/8 according to Zernike

5. Operation of the microscope

Since the tube of the DIALYVERT can be easily inserted on the stand, the microscope can be operated very practically and conveniently in the tilted position (see Fig. 24).

The left hand grips the rear rotating knob for the coarse or fine adjustment. The right hand actuates the stage grips, or the specimen directly, and/or the tube may be.

Fig. 24 Correct operation of the microscope

8.1 Observation with the condenser No. 61

Place object to be investigated on stage, apply silent drawing on the object stage on to the object guide. Choose the objective of lowest power for first observation. The lever of the aperture diaphragm is on the right-hand side, switch on the illumination. Ensure that the lamp holder is in position 1.

Focus the specimen by means of the coarse and fine adjustment.

Correct and centre and set as follows: Look through the eyepiece with fixed aperture with one eye (e.g. right-hand eye/open/right eye). Focus the microscope with the fine adjustment. Now look through the eyepiece with focusing eyepiece with the left eye.

Adjust the eyepiece until the same areas of the object also appear sharp. Do not readjust with the fine adjustment.

Now set up the correct illumination for the specimen.

First check centration of the lamp (see p. 8, paragraph 3.8).

Remove the eyepiece from the eyepiece tube, release the clamping screw, and move the lamp mount (with Lamp Housing to the lamp condenser) until the next level plane (visible aperture of the objective) is exactly illuminated.

8.1 Observation with the Series 500 swing-out condenser

Place the object to be investigated (e.g. cell) either directly on the object stage or into the object guide.

Switch on the illumination.

Focus the specimen by means of the coarse and fine adjustment.

Carry out correction for mean defects (see para. 5.1).

Ensure that the lamp mount is in position 1. For the conclusion of long intermediate distance set the lamp mount in position 2.

1 Close the field diaphragm completely in the lamp mount.

2 Lower the condenser by means of the vertical adjustment until a sharp image of the field diaphragm is formed in the plane of the specimen.

3 Centre the image of the field diaphragm with the two centring screws.

4 Open the field diaphragm so that it just disappears beyond the edge of the field of view.

Check lamp centration and illumination as under para. 8.1 a, b and c, if necessary readjust it.

Fig. 8 Centring the field diaphragm

39.1 Investigation in phase contrast according to Zernike

Two outfits are available for phase contrast investigation:

1. Phase contrast outfit with condenser No. 31 for long working distances
magnification range 63x to 2051x

2. Phase contrast outfit with special lenses and condensers for normal working distance
magnification range 40x to 1600x

39.11 Phase contrast outfit with condenser No. 31

For this device the lightning holder with its centering facility is already built into the lamp mount. In addition to the phase contrast objectives
Phaco 100/25
Phaco L 25/0.50
Phaco L 32/0.40
a light ring diaphragm (Phaco I)
and a focusing telescope are required.

Fig. 39 Light ring diaphragm

Setting the phase contrast outfit

Screw the Phaco objectives into the revolving nosepiece. Insert the telescope into the changing guide and clamp it in the working position. Focus the specimen with objective 100/.25, insert the light ring diaphragm in the slot marked "Phaco" to the stop. Completely open the aperture diaphragm.

Remove one eyepiece from the eyepiece tubes and insert the focusing telescope. Release the knurled screw on the focusing telescope and adjust the upper part until both the light and the phase ring are exactly in focus.

Check whether both rings are concentric and superimposed. If not, establish this position by means of the two centring screws.

The size of the image turned of the light ring is changed in phase contrast observation of objects in liquids when the level of the liquid varies. The necessary compensation can be carried out by adjustment of the illumination holder (uniform superimposition of light and phase ring).

Replace the focusing telescope with the eyepiece. If necessary repeat centration after magnification change.

A further check of the image formation of the ring is no longer necessary, since the centration once set is preserved.

For a rapid change over between phase contrast and brightfield illumination, merely remove or insert the light ring diaphragm in its holder.

39.12 Phase contrast outfit with Series 400 condenser

In addition to the phase contrast objectives, a Series 400 phase contrast condenser, a focusing telescope, and two centring keys are required.

Setting the phase contrast image

Screw the Phaco objectives into the revolving nosepiece, insert the nosepiece into the changing guide and clamp it in the working position.

Swing the Phaco 100/.25 objective into the beam and set phase ring 1 in the Phaco condenser.

Focus the specimen.

Close the field diaphragm.

Lower the condenser by means of its vertical adjustment until a sharp image of the field diaphragm is formed in the field of view. Centre the image of the diaphragm with the two condenser centring screws.

Open the field diaphragm so that its edges just disappear beyond the edge of the field of view.

Insert the focusing telescope in one of the eyepiece tubes.

Unscrew the knurled screw on the focusing telescope and adjust its top until a sharp image of both the light and the phase rings is seen.

When the rings are off-centre, insert the centring keys into the two side holes of the condenser and make the light and phase rings coincide by turning the centring keys.

Take out the centring keys and check this type of centration for all other objectives.

No further check of the image formation of the ring is now necessary, since centration, once carried out, is preserved. For further details see instructions "Phase Contrast Equipment" according to Zernike, No. 513 44.

Fig. 40 Condenser with phase contrast equipment according to Zernike

5.4 ULTROPAK incident-light illuminator

Attach the lamp mount 38.42 to the foot of the stand and clamp it with screw 38.40.

Push the ULTROPAK with carrier piece into the changing guide and lock it in the working position. Insert the objectives.

Insert the Lamp Housing 80 in the socket and secure it by turning it. Connect the Lamp Housing with the mains via the 12 V 30 W transformer.

Further directions are contained in the instructions ULTROPAK No. 513-80.

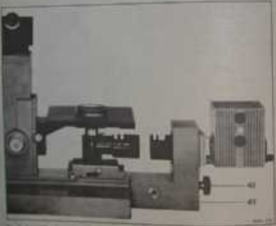


Fig. 18 [illegible] with ULTROPAK incident-light illuminator

5.5 Darkground Investigations

For the darkground illumination of objects requiring a long working distance, ring diaphragms of the Phako device in conjunction with the condenser No 81 are used for low-power work.

For this purpose the annular stop is pushed into the slot marked Phako of the lamp holder.

For large objects such as culture vessels a special holder with a 6 V 15 W illuminator is available.

This illuminator holder is pushed into the dovetail guide above the object stage instead of the usual illuminator holder and secured. When the lamp is set vertically, brightfield illumination can then also be obtained with large vessels.

Fig. 19 [illegible] with special lamp holder for large vessels

8.1 Photomicrography

General notes

It is essential to observe the following points for a good photomicrograph:

1. The precise setting of the illumination (para 8.3)
2. Critical focusing of the image.
3. Accurate determination of the exposure time.
4. Scrupulous cleanliness of all the optical faces, e.g. deflecting mirror, dust glass, condenser, objective, tube lens, eyepiece etc., accessible to the user.

Special attention must also be paid to the selection of useful magnification, the choice of a right filter for the correct spectral rendering (on black-and-white film) of the specimen, the setting of the correct colour temperature of the low-voltage lamp (with colour photography) and the choice of suitable exposure materials for photomicrography.

The following attachments are available for photomicrography with the Ortholux:

ORTHOMAT W for fully automatic microscope camera,

Micro-attachment for the LEICAFLEX with exposure sensor,

LEITZ System Camera,

LEITZ CINEMICROT automatic picture camera.

Please obtain further details about these instruments from your authorized Leitz emporium (shop).

Fig. 8 Ready-to-use tube (example)

Fig. 9 Ortholux with Automat Camera and LEICA MDa

Fig. 10 Ortholux with attachment for micro-exposure camera

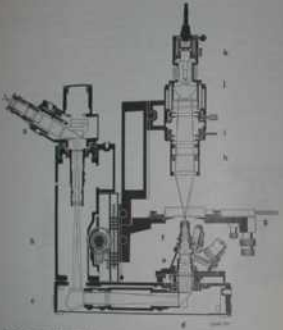


Fig. [illegible]

[illegible]

6 Care and maintenance

For protection against dust the microscope should always be covered with the flexible hood after use. From time to time the stand should be cleaned with a piece of linen or chamois leather. Methylated spirit must on no account be used for that purpose since it attacks the varnish. Petrol, on the other hand, is eminently suitable for the cleaning of varnished parts.

Light patches on the object stage caused by petrol can be removed by treatment with liquid paraffin or acid-free vaseline.

Special caution is necessary during investigations involving the use of acids, alkalis or other corrosive chemicals. Direct contact between optical components and stand and these chemicals must be avoided at all costs and all parts should be cleaned thoroughly and immediately after use.

The optical parts of the microscope must be kept scrupulously clean. Dust on glass surfaces is removed with a fine, dry sable brush; lightly blow across the surface as you apply the brush.

Bad contamination requires cleaning with a soft linen or chamois leather rag with water or [illegible].

For cleaning, objectives must not be dismantled. Any internal soiling of the objectives must be repaired in our factory.

Special care is necessary during the cleaning of anti-reflection-coated surfaces. The external surfaces of the eyepieces and the front lens of the objectives are covered with layers of [illegible] glass hardness. They must be cleaned with as much care as uncoated glass surfaces. [illegible]

Correct treatment preserves the performance of a LEITZ microscope for many years. If, however, an overhaul or repair of a damaged instrument becomes necessary, one of our agencies or our factory will be able to help.

Outfits

Outfit for low magnification brightfield

Outfit for low magnification phase contrast

Outfit for incident-light investigations with the ULTROPAK

Light source for incident light