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Large Forensic Comparison Microscope

ERNST LEITZ GMBH WETZLAR

520-10 c/Engl. R

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Large Forensic Comparison Microscope

By Heinrich Becker,
Late Director, Criminal Investigation Department, Wiesbaden, Germany

The introduction of the Large Forensic Comparison Microscope not only provided crime detection with a universal investigating instrument; it has also solved the problem of obtaining evidence in an excellent manner. Nearly all criminal investigations are dominated by the question of whether the form and appearance of two objects under examination is identical and, if not, of the nature of their distinctive features. The nature of the objects, in spite of their wide variety, is of only secondary importance in view of the advanced design of the various attachments of the instrument; they may be bullets or cartridge cases with firing pin impressions, work pieces and objects of every description with significant traces of machining and the use of tools, or graphical objects, with type or typescript impressions. Perforations or tears in fabrics and paper, dirt and paint deposits can be detected and evaluated with the same confidence as pieces of vegetation and granular substances.

Other comparison methods, such as casting jagged knife marks in plastic media, or mechanical measuring are subject to a large number of unavoidable errors inherent partly in the nature of the object, and partly in the imperfections of the embedding medium and of the mechanical measurement; examinations by comparison, with the Large Forensic Comparison Microscope, on the other hand establish most detailed and exact comparisons of the length and width of similar objects, revealing any discrepancies clearly and rapidly. A photographic record of the image, formed by the eyepiece of the two corresponding part images, constitutes a unique type of evidence, ruling out the possibility of photomontage and other interference. These outstanding features make the comparison microscope a standard instrument in crime detection which should form part of the equipment of every forensic laboratory.

It is, of course, possible to use this microscope for comparative investigations of other objects, such as samples and articles of industrial mass production with complete success.

The sturdy construction of the instrument ensures the necessary rigidity also at high magnifications.

Users of the microscope will soon appreciate the advantages of the horizontal and vertical stage movement, the large angle of tilt of the stages, and the use of a triple revolving nosepiece as a great aid to getting quick results. The auxiliary lamps mounted on the stages ensure uniformity of a set illumination of the objects even after vertical adjustment of the stages, which obviates readjustments.

Typical uses of the Large Comparison Microscope

Comparison of cartridge cases and bullets. Measuring the angle of twist and the width of flats.

Comparison of coins, bank notes, passports, postage- and insurance stamps, rubber stamp impressions, and customs seals, for detecting forgeries or evidence of previous use.

Comparison of plaster- or wax casts of traces with their originals.

Identification of blow, puncture, cut, bore, pinch and scratch marks caused by implements such as axes, knives, pliers, saws, etc.

Matching of fragments.

Comparison of machining marks on finished products to establish the origin of wire, nails, screws, matches, etc.

Investigation and identification of type impressions and other printed matter, of superimposed writing such as line intersections with ball-pen and other ink, pencils and coloured pencils, stamping ink etc. Comparing the sizes of printing screen and line patterns.

Comparison of paper surfaces; of dyed or treated surfaces of all kinds, of separating edges and punched holes.

Comparison of fabrics and seams.

Investigation and identification of fibres, bristles, and hairs.

Investigation and comparison of the shape, colour, effect, and consistency of adhesions, stains, and rust.

Comparison of powdered or granulated substances to establish the presence of additives and the degree of fineness of crushed foodstuffs and animal fodder, sand, ashes, etc.

In criminalistic and customs investigations, this instrument has many more uses, all of which are impossible to list here.

The floor stand

With the instrument all the methods of examination normally used in present-day comparative microscopy are possible.

The floor stand is used in forensic laboratories for particularly difficult and prolonged investigations. Its special advantages are :

Great stability and freedom from vibration due to its sturdy construction and cast-iron base.

Levelling screws to compensate for irregularities in the floor. Constant eyepiece height (44" = 110 cm) above floor level due to fixed tube.

Constant magnification setting of the photographic attachments due to fixed tube.

Large, ground stage plate with 2 grooves. Simultaneous adjustment of both objects for height, width and depth, acting on the stage plate. Objectives of perfectly matched magnification.

Fine adjustment of each object by large hand wheel on top of the stand.

Large range of adjustment : Height : 16 3/4" = 420 mm.
Width : 5 1/8" = 130 mm.
Depth : 3 1/8" = 80 mm.

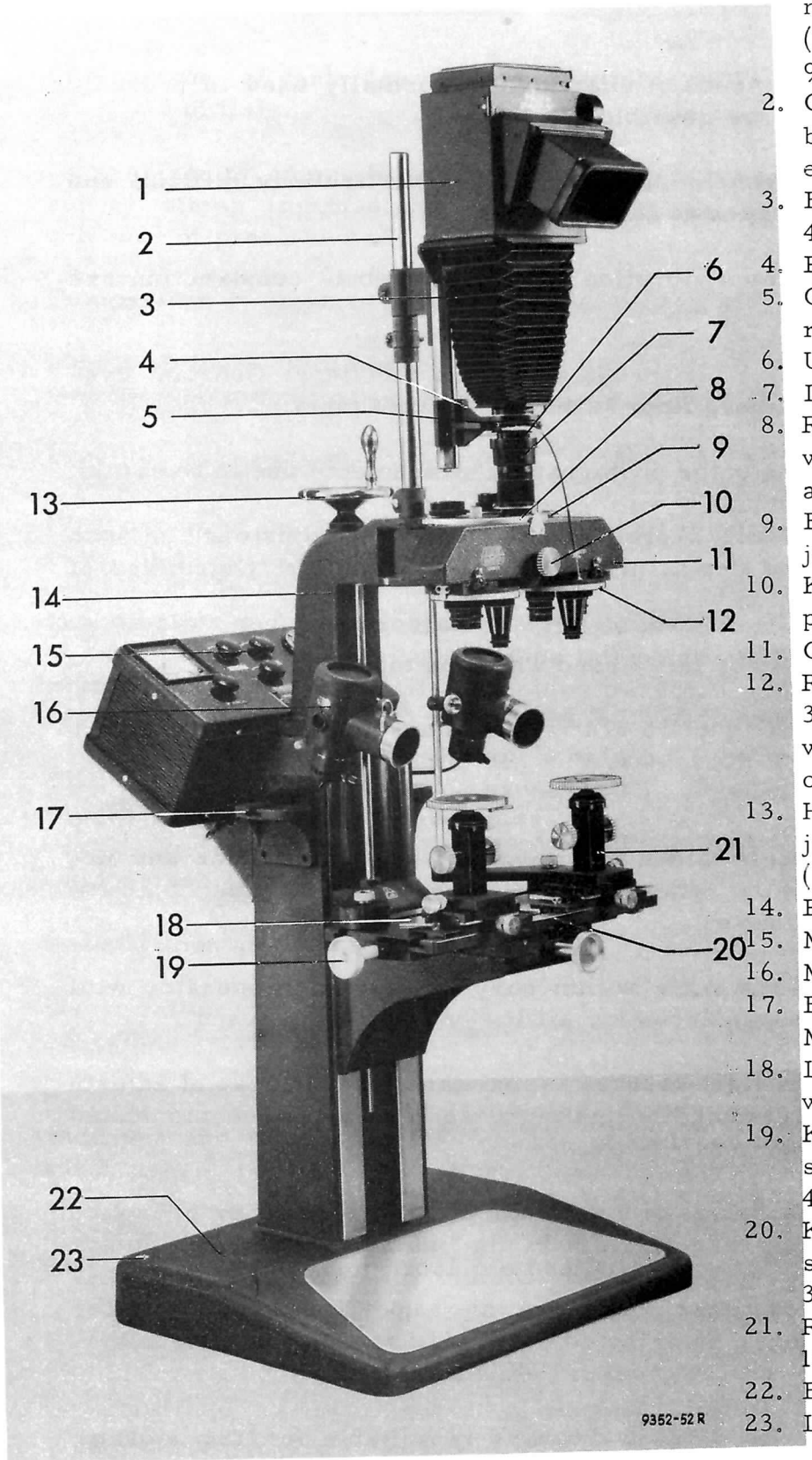
Very rapid change of magnification due to a revolving eyepiece holder and revolving objective nosepiece (the latter can be changed for a single objective holder or ULTROPAK illuminator).

Multiple transformer with large scale within easy reach of the operator with connections and separate control knobs for all low-voltage lamps used.

The angle of incidence of the light sources is maintained regardless of adjustments made to the stage plate since the lighting attachments are accommodated on the plate itself.

Photographic outfits for plate sizes of 9 x 12 cm. (3 1/4" x 4 1/4") or 6.5 x 9 cm (4 x 5") and the 24 x 36 mm. film size (LEICA 35 mm. camera) enable all objects to be photographed in black and white or colour. Photographs and transparencies obtained in this manner represent an important form of documentary evidence and have often contributed decisively to the complete clarification of a case and so led to conviction of the accused.

A drawer unit on castors, with 3 fitted drawers is suitable for the storage of the equipment.

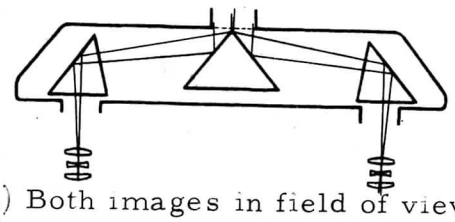


1. Mirror reflex attachment for 9 x 12 cm. (3 1/4" x 4 1/4") or 6.5 x 9 cm. photography
2. Column with prismatic bar for the photographic equipment
3. Bellows camera (3 1/4" x 4 1/4") 9 x 12 cm.
4. Fine focusing control
5. Central shutter with cable release
6. Upper light screening collar
7. Lower light screening collar
8. Revolving eyepiece holder with 3 eyepieces of 7x, 15x and 20x magnification
9. Balance control for objective magnifications
10. Knurled knob for lateral prism adjustment
11. Comparison tube
12. Revolving nosepiece for 3 objectives, interchangeable with single objective holder or ULTROPAK illuminator
13. Hand wheel for vertical adjustment of the stage plate (range: 20" = 500 mm.).
14. Floor stand
15. Multiple transformer
16. MONLA lamp
17. Bracket with groove for a MONLA lamp
18. Large, ground stage plate with two grooves
19. Knurled knob for lateral stage adjustment (range: 4 4/5" = 120 mm.)
20. Knurled knob for transverse stage adjustment (range: 3 1/5" = 80 mm.)
21. Rotating stage for incident light with cross adjustment
22. Base
23. Levelling screw

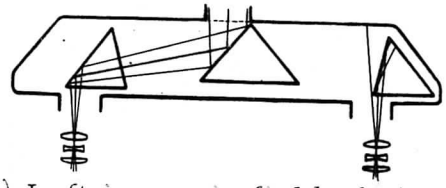
TECHNICAL DESCRIPTION

The comparison tube

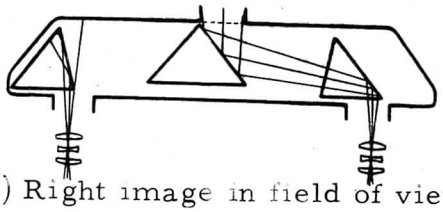
The main component of the Large Forensic Microscope is the comparison tube. The three prisms, which are firmly connected with each other, bring both beam paths together so that the two images, separated by a barely visible line, appear next to each other in the field of view. Separation of the two images is effected by the top edge of the centre prism. By means of the knurled knob on the front of the tube the prisms can be displaced laterally so that either the left or the right image can be viewed separately or in any desired intermediate setting until both images appear again halved.



a) Both images in field of view - comparative observation



b) Left image in field of view



c) Right image in field of view

With the vertical adjustment on the comparison tube both objectives are set to the same image scale. Either the 7x, 15x or 20x eyepiece can be brought into position by moving the revolving eyepiece holder as required. For low-power work and photography it is best to use the 7x eyepiece. Two dovetail guides are provided for the various objective holders, such as the revolving objective nosepiece, single objective holder or ULTROPAK incident-light illuminator.

Rotating stages for incident light

Both the rotating stages for incident light are fitted with horizontal cross motion (range 80 x 30 mm.) and vertical adjustment (range 35 mm.). They have a diameter of 78 mm. and a 360° scale for readings to 1°. The stages can be inclined to an angle of 22 1/2° in all directions and in one position to 45°. When released they revert to their horizontal position. Attachments for rotating bullets or for flat clamping stages measuring 148 x 210 mm. can be secured to these rotating stages. These attachments can be set, turned, or inclined with the rotating stages as required. The circular plate of each stage has a ringshaped groove and two threaded holes for accessories.

Multiple transformer

This new type of regulating transformer has connections and controls for low-voltage lamps taking three different leads, for up to 5 lamps to be operated simultaneoulsy. The ammeter also makes it possible to adjust two lamps of the same amperage to the same light intensity. A switch closes the circuit to each individual lamp. Coloured marks considerably simplify adjustments and demarcate the setting range. Once a given intensity has been set for one lamp it is maintained even if another lamp has meanwhile been switched on.

The following lamps can be used

1	12v/100 W lamp	red mark
2	6v/ 30 W lamps	blue mark
2	6v/ 15 W lamps	yellow mark

Illuminating arrangements

Different types of lamps are available to meet the requirements of various methods of examination. Some can be used universally, such as the well-known MONLA lamps for microscopy, others, such as fluorescence lamps with clips to secure them to the holders of the MONLA lamps serve special purposes.

As already mentioned, all lamps excepts the fluorescence lamps and the macro illuminator can be connected to the transformer and can be used singly or in various combinations.

MONLA 6 v/30 W microscope lamps on long holders

These lamps, on universally adjustable supports, have angle markings, adjustable illuminating lenses and slots for groundglass screens or filters. They are extremely versatile and indispensable in comparison microscopes; outstanding features are their high luminous density and large adjustment range. They have therefore been included in the basic outfit as the standard illuminators (blue mark).

ULTROPAK 6 v/30 W lamps

These lamps, a special form of the MONLA lamps, were designed specially for the ULTROPAK incident-light illuminator. The already mentioned advantages of the MONLA lamps ensure an unusually bright image even of objects of low reflectance (blue mark).

6 v/15 W clamping lamp

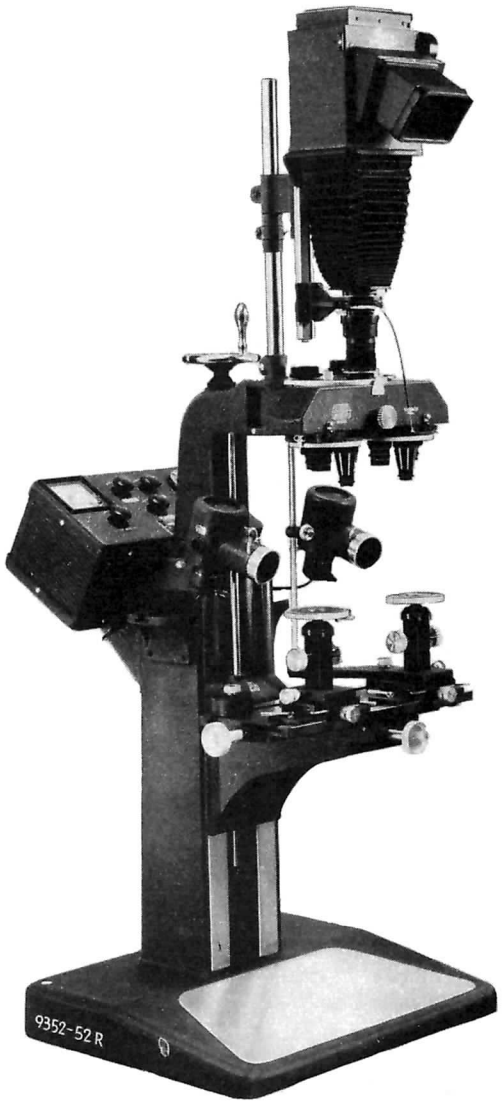
These lamps have proved especially suitable for the examination of bullets or cartridge cases. They are fitted with ball-and-socket joints and are clamped to the incident-light rotating stage which makes them turn with the stage so that they are always in line with the objects; this ensures constant illumination (yellow mark).

6 v/15 W lamp attachment for transmitted light

These lamps are inserted in the baseplate of the microscope (520 088) (yellow mark).

Macro-ring illuminator

For the uniform illumination of large single objects the macro-ring illuminator is attached to the prismatic bar. It is possible to achieve different lighting effects by means of sector diaphragms.



Floor stand - basic outfit

COMPLETE OUTFIT

Floor stand

Sturdy stand on heavy base with levelling screws and foot rest. Supporting bracket with stage plate, adjustable on the vertical column.

Grooved brackets on both sides of the column to take lamp attachments if required. Bracket for the multiple transformer. At the top of the stand two swivelling support arms with dovetail guides for either the comparison tube or a micro, stereo or angle-measuring tube. Behind this is a clamping collar for securing the column for photographic attachments.

520 068

Comparison tube with revolving eyepiece holder for 3 eyepieces; Ramsden eyepieces with focusing eyelens, magnifications of 7x, 15x and 20x. Two dovetail guides with magnification adjustment, alternatively for revolving objective nosepieces, single objective holders or the ULTROPAK incident illuminator — 520 050

2 revolving objective nosepieces, each for three low-power objectives with focal lengths of 100 mm, and less; with 3 objective adapters — 520 049

Paired objectives for same

2 35 mm. SUMMAR® f/4.5 objectives with iris diaphragm — 520 054

2 65 mm. MILAR® f/4.5 objectives with iris diaphragm — 520 040

2 100 mm. MILAR f/4.5 objectives with iris diaphragm — 520 039

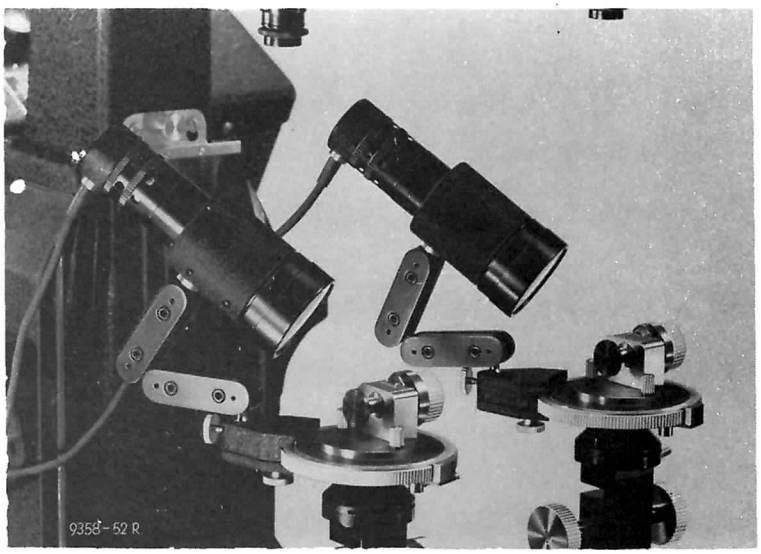
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See page 23 for single objective holders and other objectives

Multiple regulating transformer with connections and control knobs for one 12 v 100 W, two 6 v 30 W and two 6 v 15 W lamps; ammeter and switch; lead for connection to 110 - 127 - 220 - 240 v a.c. mains	500 028
2 MONLA 6 v 30 W microscope lamps with adjustable illuminating lenses; universally adjustable holder with angle markings; groundglass screens; mains cables and plugs	520 052
2 rotating stages for incident light (one right and one left) with horizontal cross motion and vertical adjustment	520 069
Column with prismatic bar for the photographic attachments	520 012
9 x 12 cm., (3 1/4" x 4 1/4") camera bellows extending to 24" = 60 cm.; plate holder; one groundglass screen and one clear glass plate, 2.9 x 12 cm. darkslides with 6.5 x 9 cm. adapters, 6 x focusing magnifier, shutter for time exposures and instantaneous speeds up to 1/125 second; synchronized flash connection; cable release; rack-and-pinion focusing of objectives for macro photography; tape measure for measuring the bellows extension; upper and light screening collar	520 060
Mirror reflex attachment with swing-out mirror, for viewing and focusing the image on the groundglass screen from the operating position	542 084
Plastic cover for the basic stand	520 066
Basic outfit for the floor stand	520 071
Transport case for the floor stand and basic outfit excluding comparison tube *)	520 072
Transport case for the comparison tube	520 067
Special fitted cases are supplied for the accessories and optical equipment	
Drawer unit on castors, with 3 fitted drawers	513 258

*) Read instructions before unpacking the outfit

ACCESSORIES
==========



Bullet-rotating attachments
with clamping light fittings



Examination of cartridge cases
(Illumination by twin lamp)

Attachment for examining bullets and cartridge cases

Bullet examinations

2 bullet-rotating attachments, knurled adjusting drums with a 360° scale graduated at 6° intervals 520 070

2 x 2 mounts for cementing bullets of various calibres in position with mandrel fitting into the sleeve of the rotating attachment 520 083

2 rectangular plates with slots for white paper or tin foil reflectors etc. to illuminate the unlighted portions of the object 520 084

Examination of cartridge cases, especially for comparing firing pin impressions

2 mounting attachments for cartridge cases, with centring sleeve 520 085

2 x 3 mounts for cartridge cases of various calibres, with mandrel fitting the sleeve of the mounting attachment 520 086

2 clamping 6 v 15 W lamps on ball-and-socket arms with cables and plugs 520 064

Complete outfit for the examination of bullets and cartridge cases 520 081

Accessories for the comparative examination of objects of up to 6 x 8 in.

Clamping stages 148 x 210 mm. = 6" x 8"

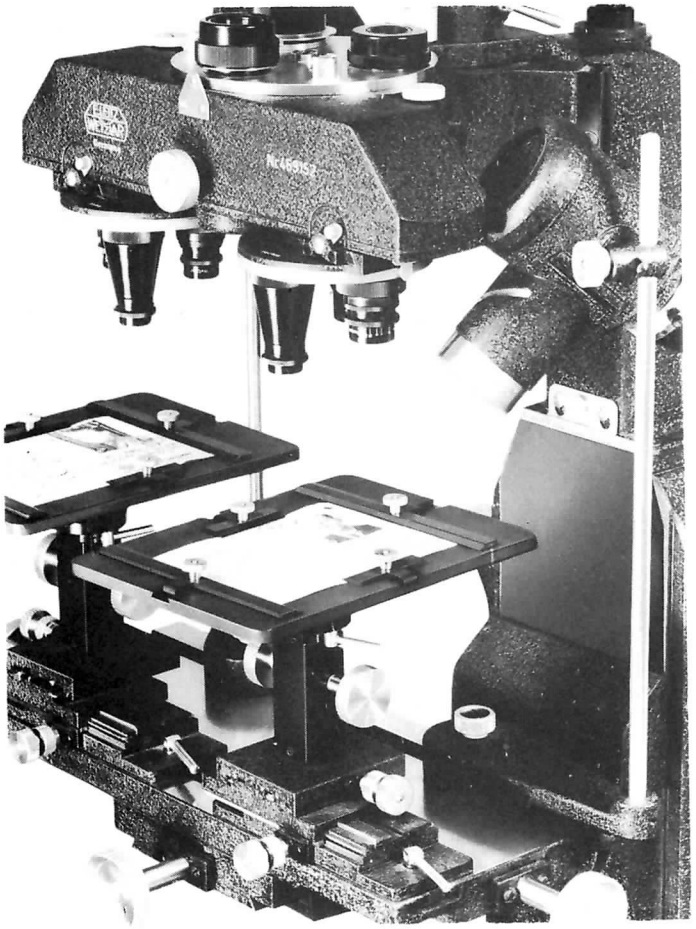
2 sturdy metal stages for examinations in incident light, with two cross-shaped clamping grooves;

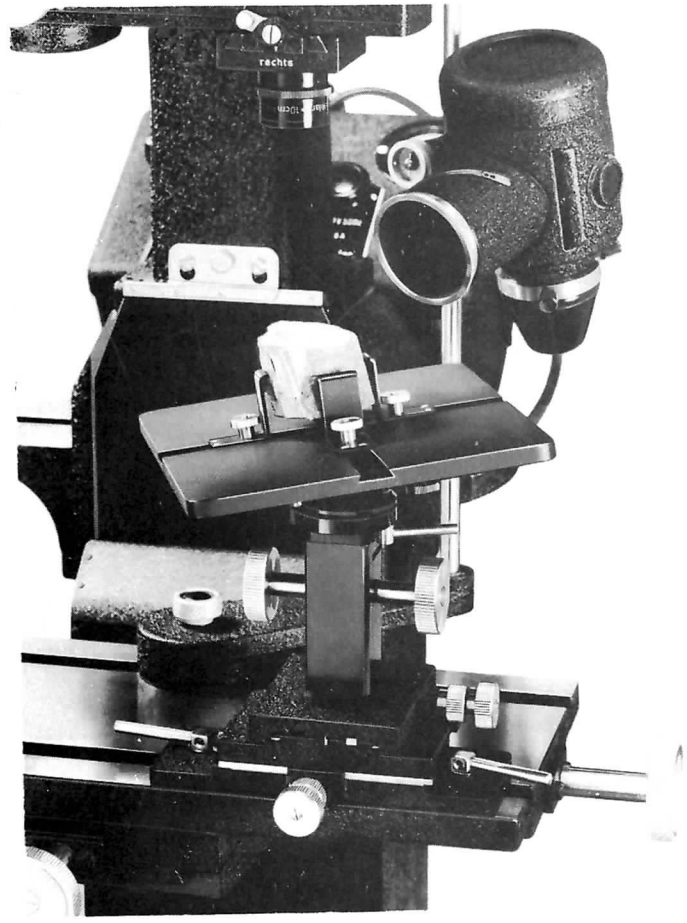
2 short and 2 long spring clips for holding flat objects such as passports, photographs etc. in position.

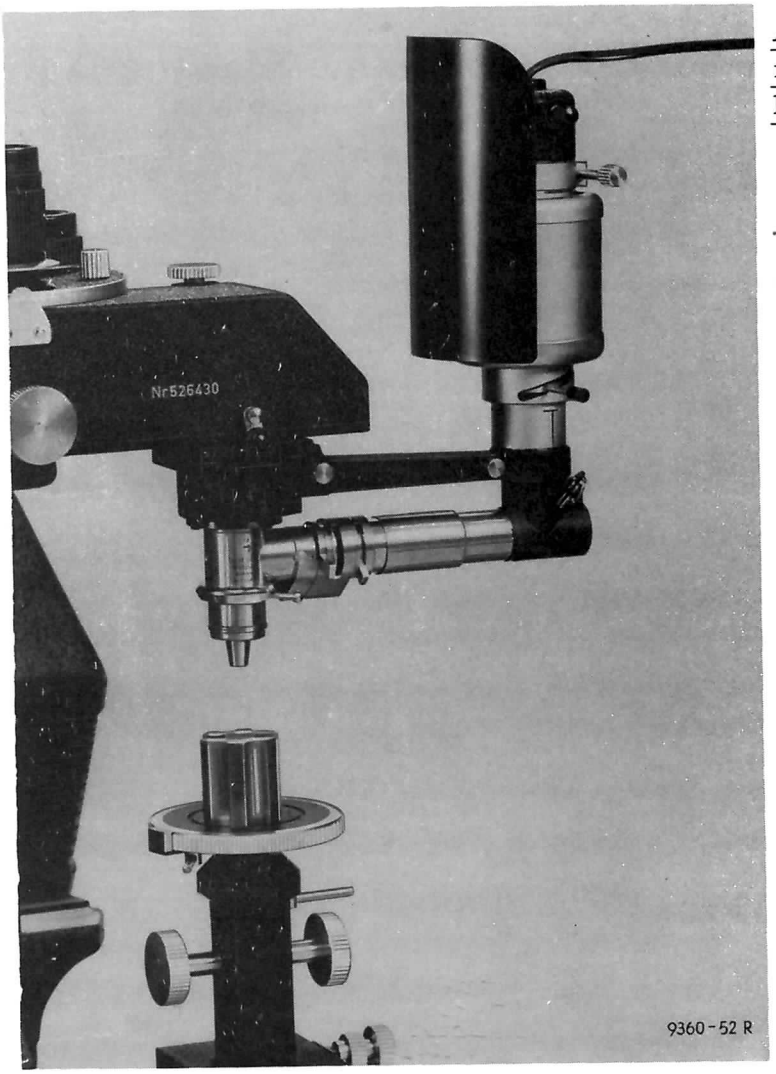
4 toothed spring clips for securing raised objects such as small tools, weapons, pieces of wood etc.

2 clamping stages 6 x 8" each fitted with 4 spring clips and 4 toothed spring clips each, complete

520 055







Accessories for examinations in incident light (micro)

ULTROPAK incident-light illuminator

2 ULTROPAK illuminators on dovetail bracket, with polarizer and analyser; bayonet changer for the objectives; one set each of sector diaphragms with ground-glass screens, daylight, green and yellow filters. Two 6 v/30 W lamps on each side — 520 183

with the following pairs of achromatic objectives:

UO 4/0.10	520 187
UO 6.5/0.18	520 043
UO 11/0.25	520 044

2 metal stage micrometers 1 mm = 100 intervals — 520 087

Complete outfit for the ULTROPAK *) — 520 184

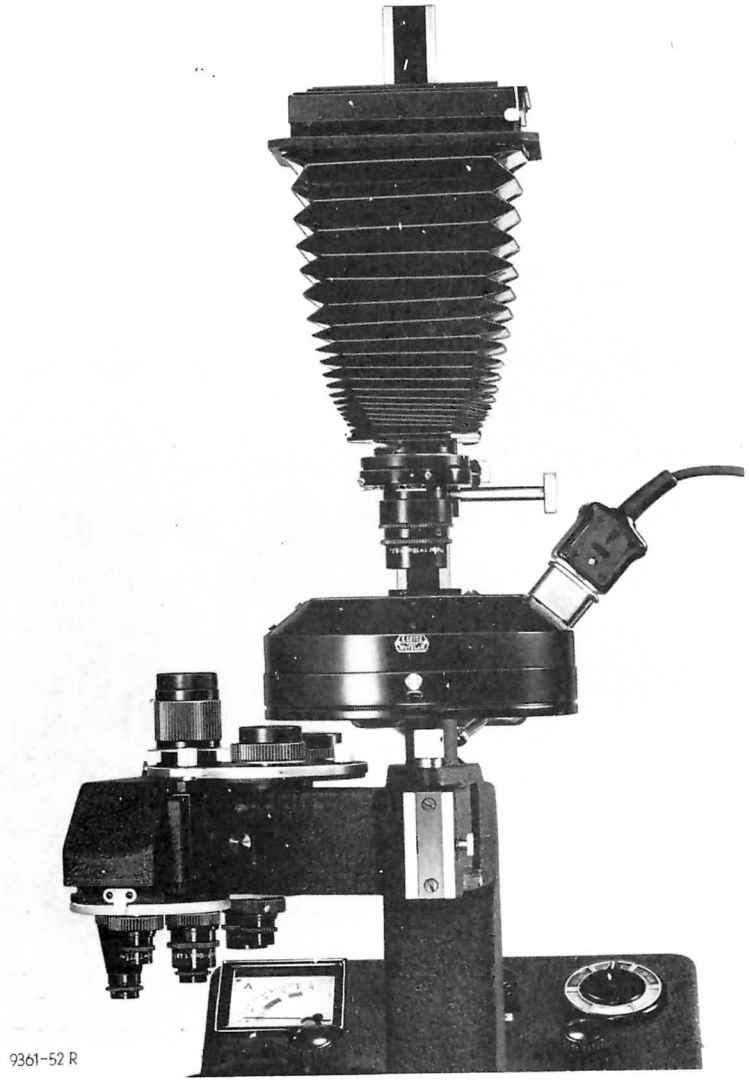
*) For further ULTROPAK accessories see special list 51-36 b

Accessories for photographing larger single objects

Wooden stage, 420 x 594 mm. = 17" x 40" covered with black felt; holder for clamping in the grooves of the large stage plate fitted to the floor stand
520 047

Macro ring illuminator with holder, for attachment to the prismatic bar of the camera; lamp housing, with two circuits, each with six 6 v 5 W low-voltage lamps connected in series; ring-shaped opal glass in interchangeable mount; 3 reflectors; 2 sector diaphragms; 2 intermediate rings for objectives from 20-35 mm and 45-65 mm. focal length; mains cable with plug
520 048

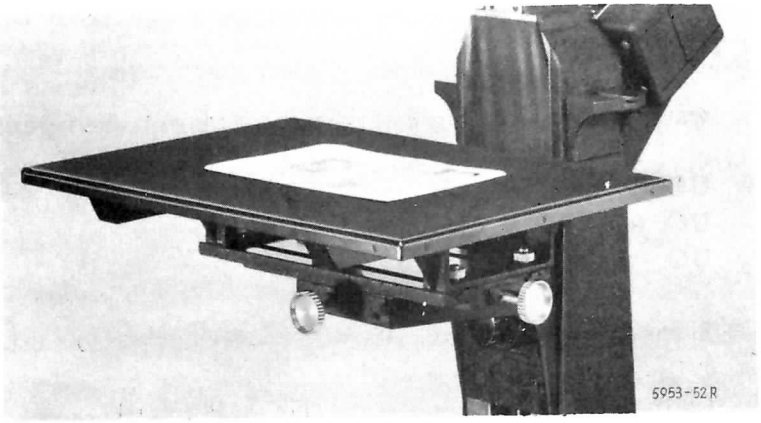
Regulating transformer with voltmeter for connection to 110-240 v a.c.
520 052



Ring illuminator (comparison tube swung out on long support arm)

180 mm PHOTAR f 6.3 objective with iris diaphragm
520 008

Adapter ring for PHOTAR
543 106

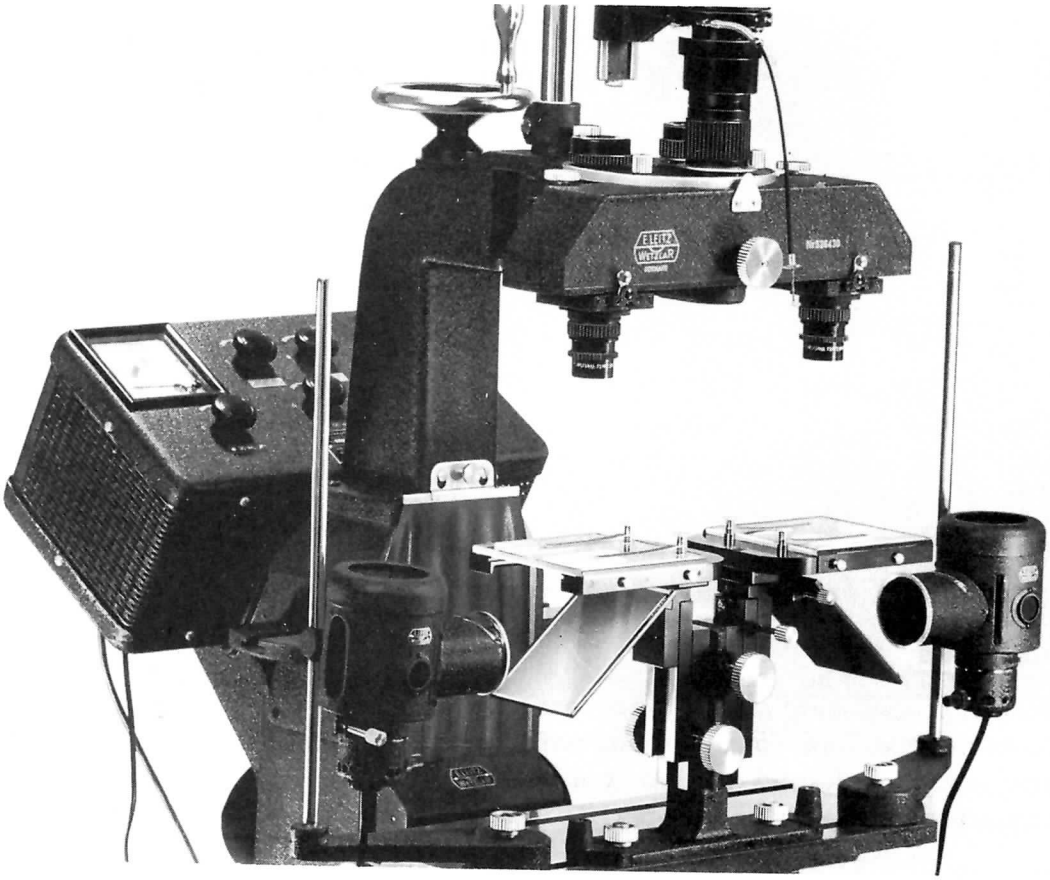


Wooden stage 16 1/2 x 23 1/2"

Complete outfit for photographing large single objects *) for floor stand — 520 093

Complete outfit for table stand — 520 004

*) Adapter rings are required when using objectives of shorter focal lengths (see page 22).



9356-52 R

Accessories for examinations in transmitted light

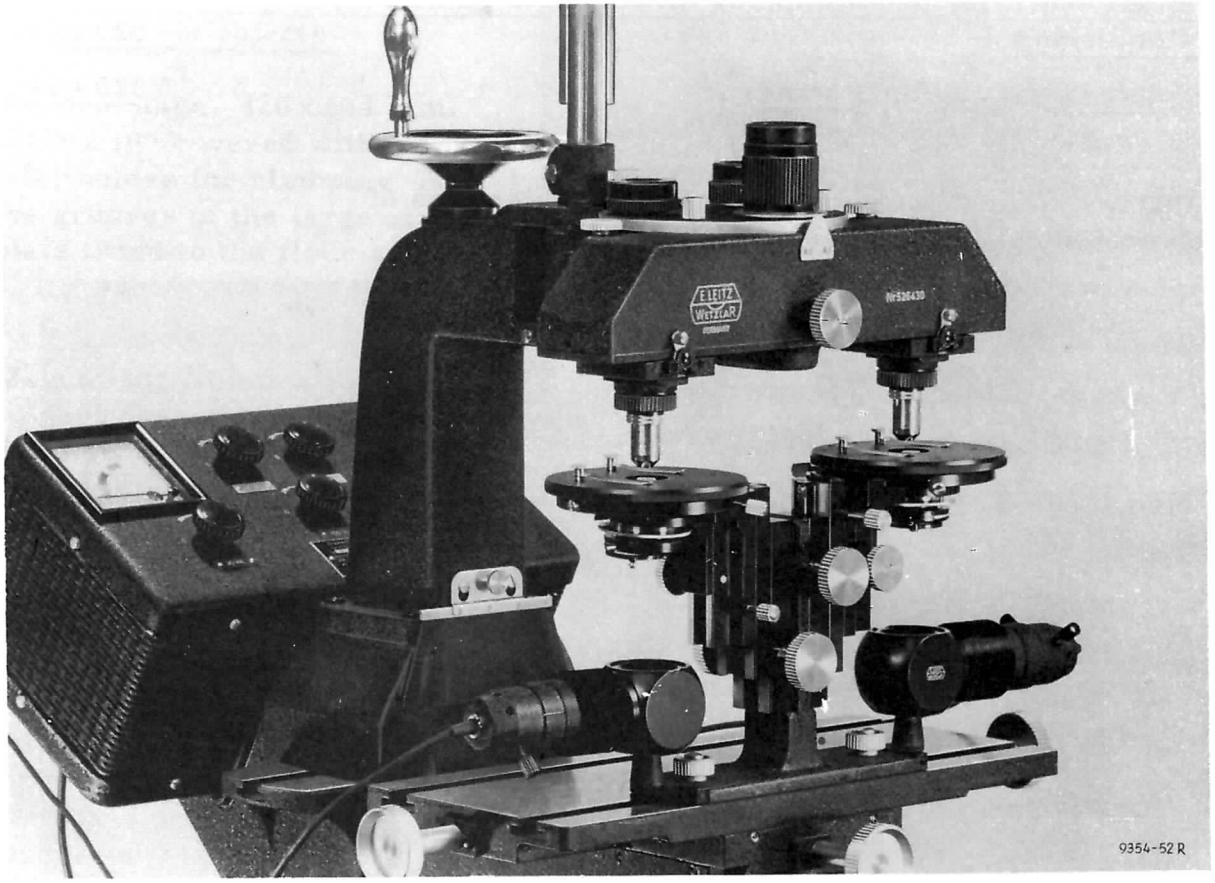
Microscope base with clamping vertical adjustment on both sides of the stand; dovetail guides for the transmitted-light stages; holes for the 6 v 15 W lamp attachments for microscopy in transmitted light; (only required once when ordering 520 092 and 520 099) — 520 088

Low-power observations

2 low-power stages for transmitted-light examinations, on supporting brackets, attachable to the base of the microscope; with glass plates and opal and darkglass inserts — 520 089

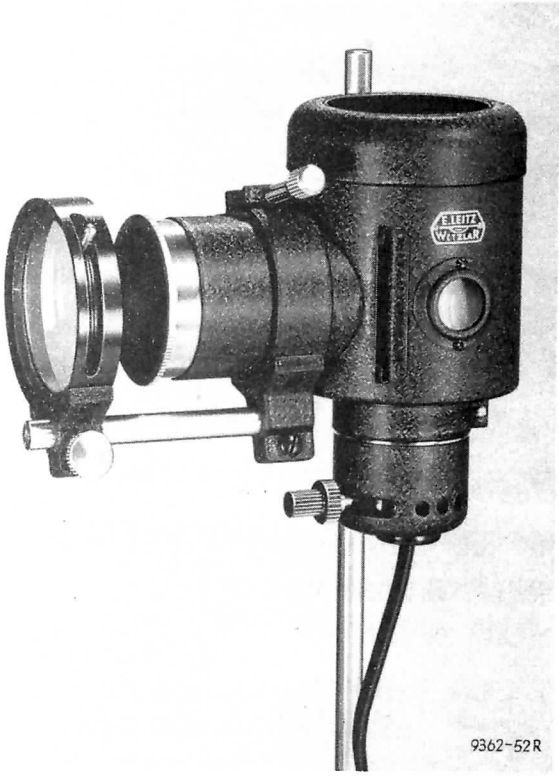
2 65 mm. condenser lenses for this outfit

Complete outfit for low-power work in transmitted light (without 520 088) — 520 092



Micro-examinations

2 circular rotating and centring object stages No. 223 for micro examinations, on supporting brackets; dovetail guide with rack-and pinion control for condensers (attachable to the microscope base 520 088)	520 090
2 50 mm. MILAR f/4.5 objectives anti-reflex coated with iris diaphragm, and intermediate rings	520 046
2 achromats 3.5/0.10 with adapter rings	520 188
2 achromats 6/0.18 with adapter rings	520 094
2 achromats 10/0.25 with adapter rings	520 095
2 single objective holders	520 100
2 condensers for MILAR objectives	520 045
2 two-lens centring condensers No. 70 r, N. A. 1.20 with iris diaphragm and filter holder, in dovetail changer (for micro-objectives)	520 097
2 6 v 15 W lamp attachments for microscopy in transmitted light, fitting into the right and left of the microscope base	520 057
2 stage micrometer, 2 mm. = 200 intervals	520 096
Complete accessories for micro-examinations in transmitted light (but without 520 088)	520 099
2 attachable mechanical stages No. 43 to supplement the circular object stages No. 223	520 098



Monla lamp with polarizing filter (polarizer)

Accessories for comparative observations in polarized incident and transmitted light

2 filter polarizers rotatable through 90°, in mount, for clamping to the illuminating tube of the MONLA lamps 520 058

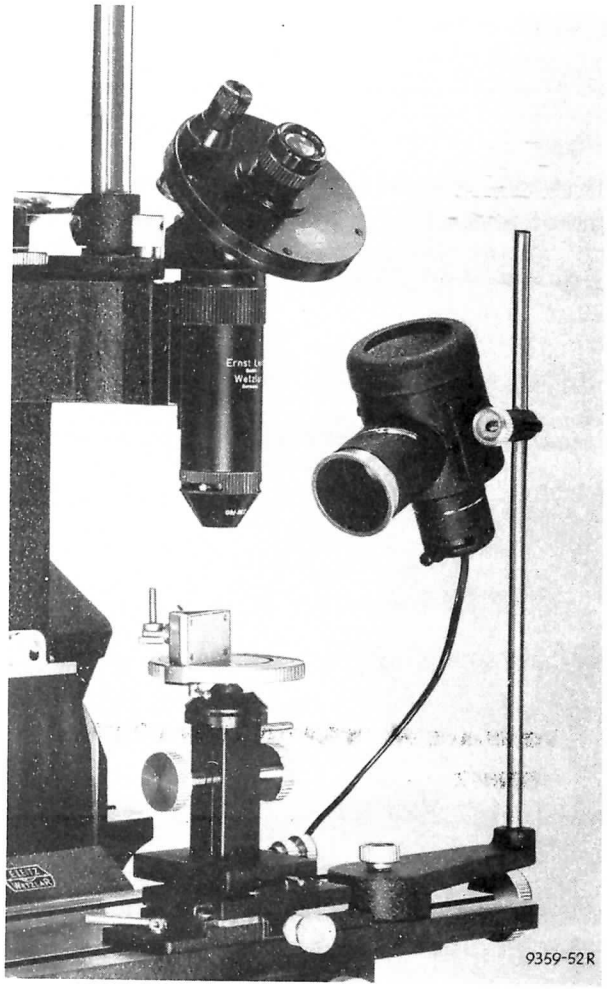
2 single objective holders with built-in analysers and compensator slots 520 061

2 λ-plates, in mount 520 063

2 λ/4 plates, in mount 520 062

2 plano-concave mirrors (for micro transmitted-light polarization) 520 059

Complete outfit for work in polarized light 520 016



Angle-measuring attachment

Accessories for angle measurements

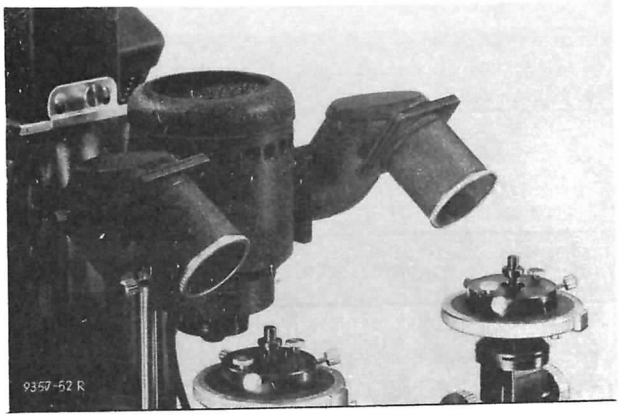
Simple, interchangeable, measuring microscope tube with inclined eyepiece, on supporting bracket; 3 ET objective; goniometer eyepiece with built-in graticule rotatable by means of a knurled knob, and angle reading device, total magnification 30 x; adapter for securing the measuring microscope to the short support arm 520 041

Other tubes

Microscope and stereo microscope tubes can be used on special adapters (details on request)

ILLUMINATING OUTFITS

12 v 100 W twin lamp (for floor stand only) with two lamp guides, universally adjustable, angle markings; adjustable illuminating lenses; slots for ground-glass screens or filters; groundglass screens, daylight filters; mains cable and plug for connection to the multiple transformer; on adjustable lamp holder.

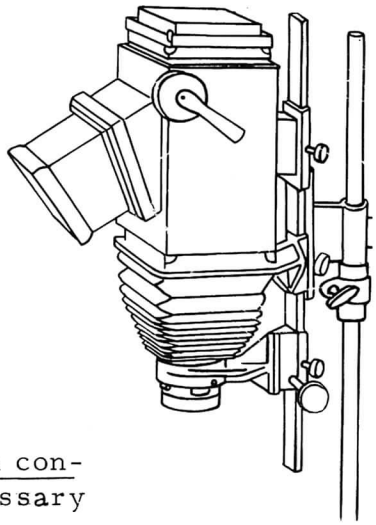


Twin lamp in working position

2 MONLA 6 v 30 W microscope lamps, as described on page 10 (included in the 520 071 complete outfit)	520 052
2 ULTROPAK 6 v 30 W illuminators, as described on page 7, (with cables and plugs included in the complete outfit for ULTROPAK (520 183))	520 169
2 6 v 30 W clamping lamp attachments on ball and socket arms for securing to the incident-light stages, with mains cables and plugs (contained in the complete outfit 520 081 for the examination of bullets and cartridge cases)	520 064
2 6 v 15 W lamp attachments for microscopy in transmitted light, insertable left and right in the base of the microscope (included in the complete outfit 520 099 for micro-transmitted-light observations)	520 057
Macro-ring illuminator with holder (included in the 520 093 complete outfit for photography of large single objects)	520 048
Regulating transformer for this attachment (included in the 520 093 complete outfit for photography of large single objects)	500 052

[redacted]

PHOTOGRAPHIC EQUIPMENT



Photographic equipment for the 9 x 12 cm. ($3\frac{1}{4}$" x $4\frac{1}{4}$") and 6.5 x 9 cm. formats, comprising:

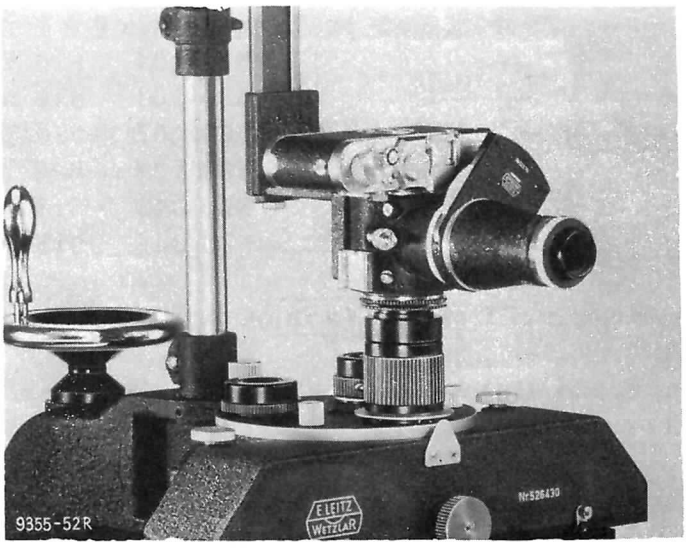
9 x 12 cm. Camera bellows (included in 520 071), excluding 520 012	520 060
Mirror reflex attachment (included in 520 071)	542 084
4 x 5" camera	on request

Photographic attachment for the 24 x 36 mm. format in conjunction with the LEICA 35 mm. camera (520 012 necessary if not already available)

Micro-mirror reflex attachment (VISOFLEX II) with 5 x focusing magnifier and cable release, for LEICA M-models, with adapter and holder with 1/4" screw	543 097
1/3 x adapter	543 075
Small light screening ring for above	520 013

Complete outfit for 35 mm. photography (without LEICA and without column and prismatic bar 520 012) 520 010

If a camera body is not available we recommend the LEICA M Da body with shutter speeds of 1 to 1/1000 sec, B setting, without rangefinder, and without lens (further LEICA models on request)



Leica with micro-mirror reflex attachment and 5 x focusing magnifier

MICROSIX-L Exposure meter

comprising:

recording instrument and measuring cell with photo-resistor, for 2 measuring ranges, in case 543 058

LIST OF OBJECTIVES, CONDENSERS AND MICROMETERS

(Two parts are always required for comparative examinations)

Low-power objectives		Pair	Single
35 mm. SUMMAR f/4.5 (included in 520 071)	and with adapters	520 054	549 011
50 mm. MILAR f/4.5 (included in 520 099)	"	520 046	549 007
65 mm. MILAR f/4.5 (included in 520 071)	"	520 040	549 036
80 mm. SUMMAR f/4.5	"		549 013
100 mm. MILAR f/4.5 (included in 520 071)	"	520 039	549 005
120 mm. SUMMAR f/4.5			549 018
2 single objective holders for all objectives of up to 120 mm. when used on the comparison tube		520 100	
2 intermediate rings to enable the use of two micro objectives on the comparison tube (included under code-numbers 520 188, 520 094 and 520 095)		520 080	
180 mm. PHOTAR f/6.3 (included in 520 093)			549 008

For the use of the SUMMAR and MILAR objectives not on the comparison tube, but as single objectives (for macro photography) a special adapter ring is necessary for each objective:

For 35 mm. SUMMAR and 50 mm. MILAR	adapter ring	520 127
65 mm. MILAR	" "	520 126
80 mm. SUMMAR	" "	520 124
100 mm. MILAR	" "	520 128
120 mm. SUMMAR	" "	520 125

ULTROPAK objectives		
UO Sp 1.5/L 110	520 104	810 343
UO Sp 2 x/L 90	520 103	810 344
UO Sp 3 x/L 60	520 102	810 345
UO 4/0.10 (included in 520 056)	520 187	518 182
UO 6.5/0.18 (included in 520 056)	520 043	513 004
UO 11 /0.25 (included in 520 056)	520 044	513 005

For further ULTROPAK objectives see special list 513 - 36

Objectives for transmitted-light microscopy		
Achromat 3.5/0.10 (included in 520 099)	520 188	519 036
Achromat 6/0.18 (included in 520 099)	520 094	519 001
Achromat 10/0.25 (included in 520 099)	520 095	519 004

	Pair	Single
Condensers		
Widefield condenser in dovetail guide for MILAR and SUMMAR (for low-power observations in conjunction with the transmitted-light micro stages, included in 520 099)	520 045	512 108
Condenser No. 70 r A 1.20 with iris diaphragm and filter holder, in centring dovetail changer		
Object micrometers		
Metal, for incident light, 1 mm. = 100 intervals (included in 520 056)	520 087	563 011
Glass, for transmitted light, 2 mm. = 200 intervals (included in 520 099)	520 096	513 106
Spare parts		
12 v 100 W filament lamp		500 037
6 v 30 W filament lamp		500 011
6 v 15 W filament lamp		500 012
6 v 5 W filament lamp		500 009
Cable release for central shutter		543 037
6 x focusing magnifier for bellows camera		543 059
9 x 12 cm groundglass screen in metal frame		542 037
9 x 12 cm clearglass plate in metal frame		542 038
Metal darkslide, 9 x 12 cm		543 025
6.5 x 9 cm adapter for darkslide		543 026
Upper and lower light screening ring		520 014
All-metal cassette for LEICA, model N with container (for bulk film)		14 006

Design subject to alteration without notice.

The illustrations contained in this brochure may not conform in every detail to instruments supplied.

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