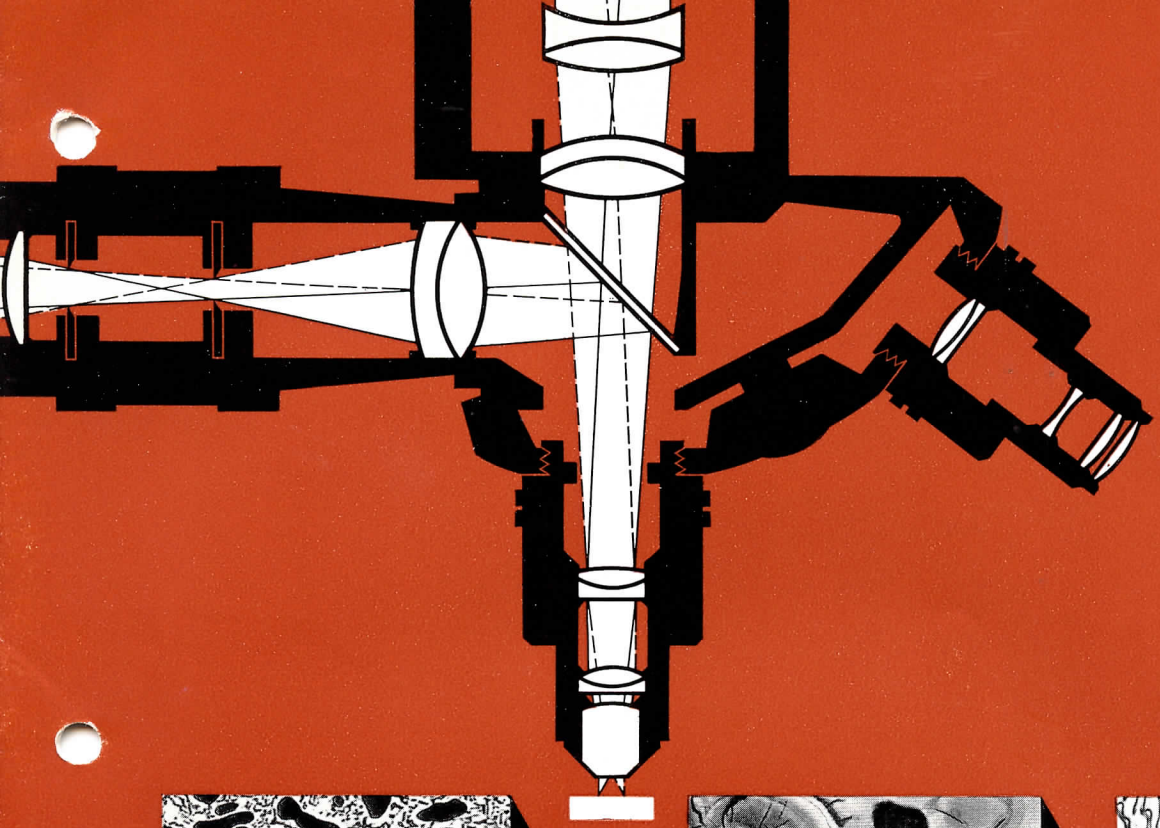
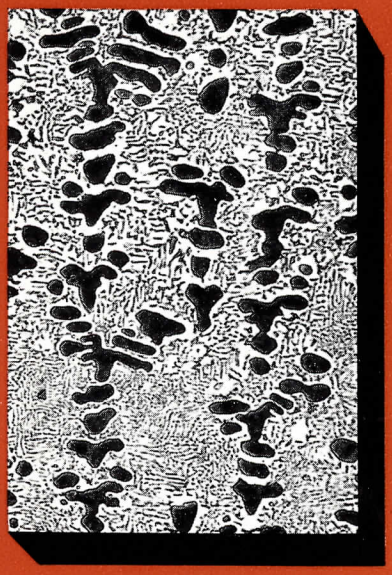
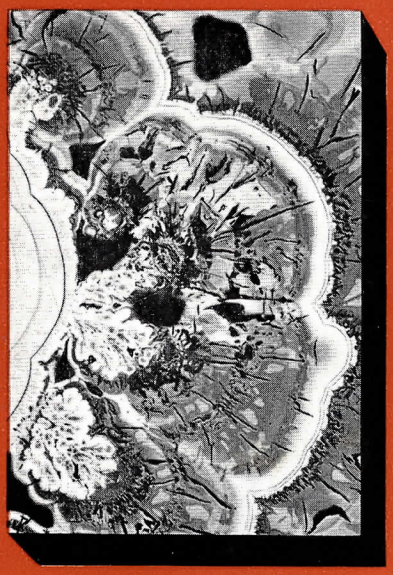
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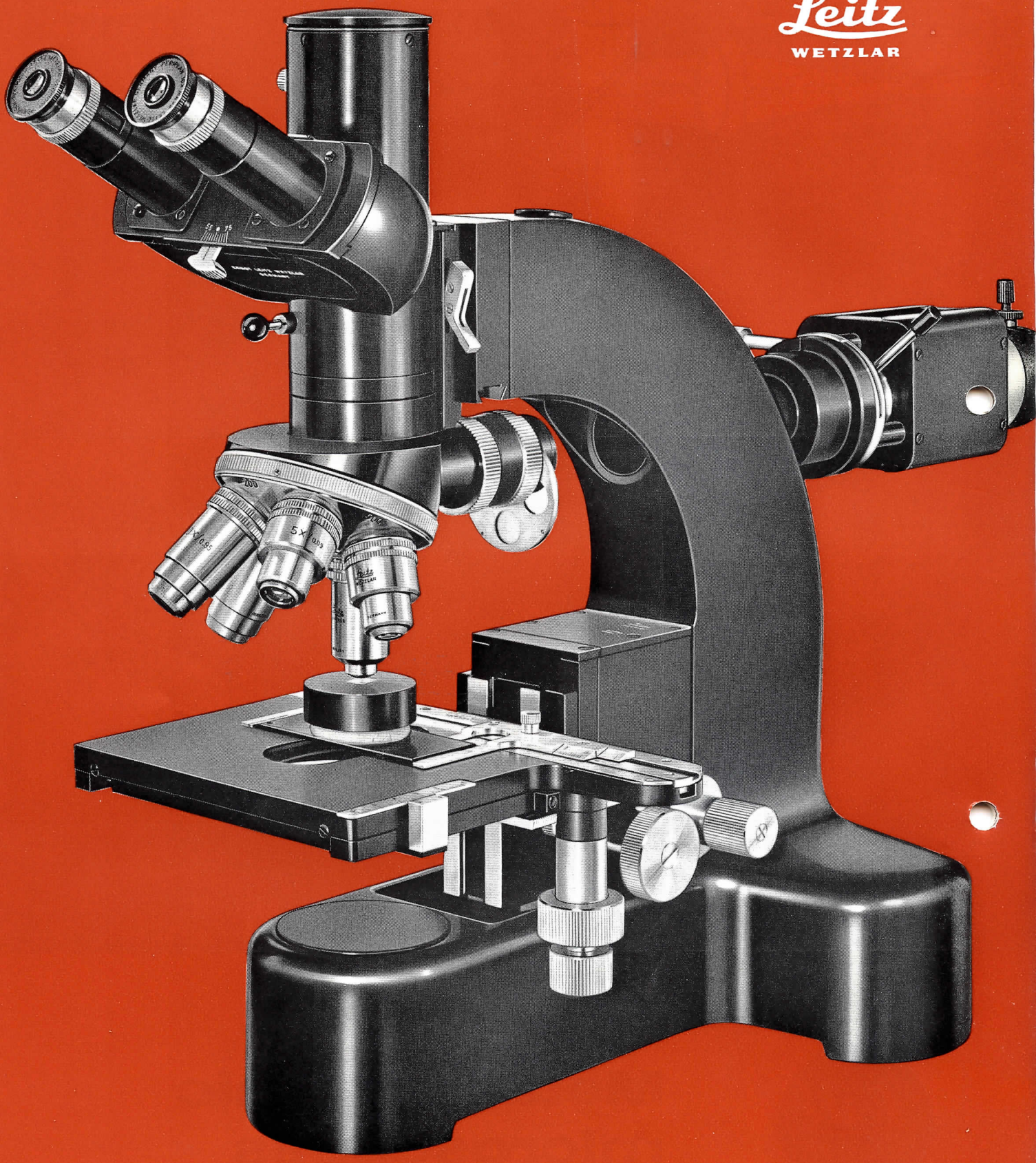


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Metallographic microscopes

56 - 15 / Engl.

Leitz
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**METALLUX metallographic microscope with FS tube,
Opak illuminator with 5 objectives,
mechanical stage No. 252 and 6v 30W low-voltage lamp**

This list comprises a variety of well-tried metallographic microscopes and accessories for the investigation of polished sections and non-destructive testing of workpieces.
Information about accessories not listed here may be obtained from our special lists. We recommend particularly.

List 515-73 Microscope heating stage 1350 for transmitted- and incident light

List 515-68 Microscope heating stage 1750 for incident light

List 51-72 Lamp housing 250 for Xenon lamps etc.

List 54-20 ORTHOMAT fully automatic microscope camera

List 56-12 contains detailed information about our MM5 metallographic microscope, a large Le Chatelier type research and routine microscope

METALLUX | metallographic microscope

The METALLUX® metallographic microscope is a highly efficient research- and routine microscope specially adapted to the needs of the modern industrial laboratory. It is equally suitable for the widely varying demands of a medium-size works laboratory and the requirements of a large department engaged in routine checks of serial sections. Its tall design allows to some extent the examination of finished parts with polished surfaces or of portions of workpieces which are accessible only with difficulty (non-destructive testing).

Structural details

- Smooth, extremely robust corrosion-resistant alloy stand, with built-in 6v 30W illuminator.
- Interchangeable tubes, revolving nosepieces, illuminators, e.g. lamp housing 250.
- Quintuple revolving nosepiece with achromatic and apochromatic objectives for the 50x, 100x, 200x, 500x, and 1000x standard magnifications for material testing.
- Incident-light illumination by Opak illuminator with aperture- and field stops and half stop for oblique illumination.
- Stand adaptable for phase contrast microscopy.
- Versatile application of ancillary microscope equipment, such as television attachments, heating stages, etc.

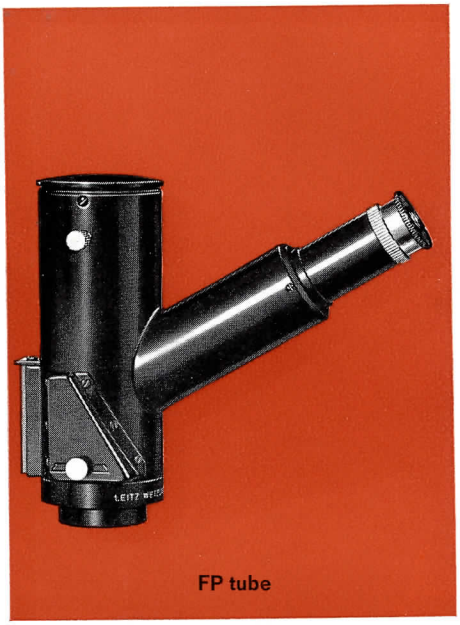
Technical details

Stand

The smooth, very robust stand consists of corrosion resistant light alloy. Separate coarse- and fine adjustment mechanisms are built into the foot of the stand; running on ball tracks they permit focusing of the microscopic image unaffected by all external influences. The focusing mechanism acts directly on the object stage and is therefore independent of the extra weight of ancillary equipment on the tube. Also, inclination and level of the tubes remain unchanged.



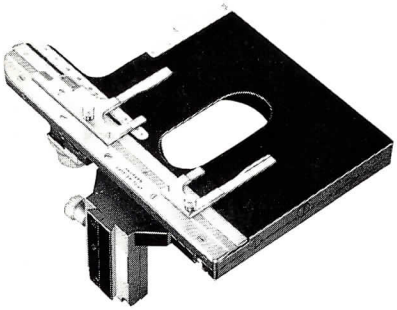
FS tube

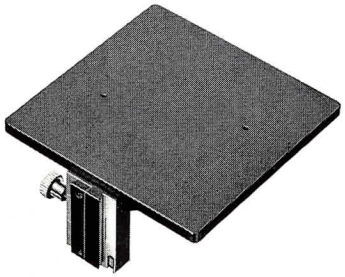


FP tube

Tubes

Two tubes are available for the METALLUX. Whenever possible the binocular phototube FS should be chosen because it allows observation with relaxed eyes corresponding to normal vision. The microscope can also be fitted with the simpler monocular phototube FP. Both tubes can be used for photography, e.g. with the LEICA or the 6.5x9cm attachment camera. The most suitable picture area is chosen in the field of view and the image focused in the eyepiece. A hinged deflecting prism permits the immediate change-over from visual observation to photomicrography.





Mechanical stage No. 252

Object stage No. 218

Object stages

All object stages of the METALLUX are interchangeable. They can be vertically adjusted independently of their coarse and fine focusing mechanism so that even large objects can be examined in incident light or accessories accommodated on the stage. The following stages are available:—

Mechanical stage No 252

The standard version of the METALLUX is supplied with this stage. Its low-set controls are located on the right and are operated comfortably with the hand resting on the workbench. The setting of the mechanical stage can be read to an accuracy of 0.1mm off the vernier scale. The object guides are detachable so that the entire stage area is available, if necessary, for the investigation of large specimens.
Dimensions of the stage:— 140x130mm; traversing range: 76x40mm.

Object stage No 218

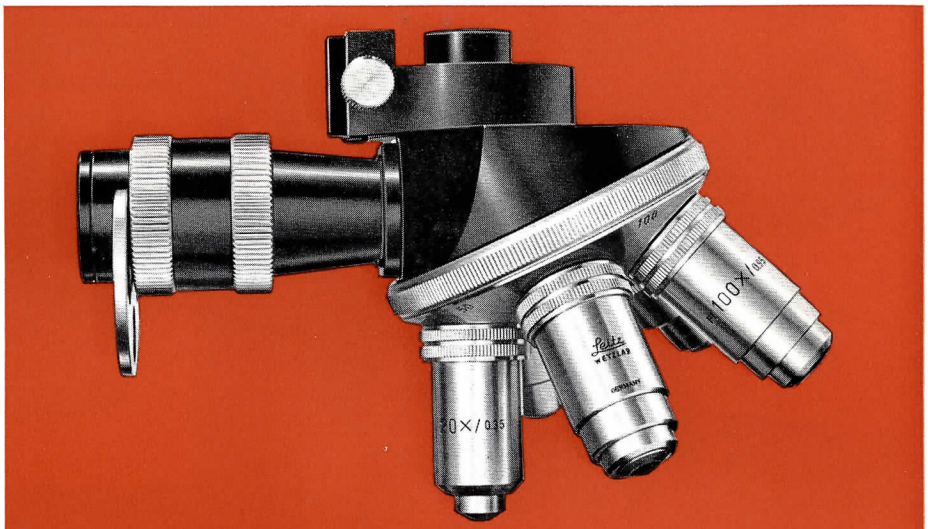
On the whole, this stage is used only for the permanent fixture of attachments such as heating stages.

Optical equipment

The achromatic and apochromatic objectives are screwed into a quintuple revolving nosepiece; as they are parfocal, only slight focusing adjustments are necessary whenever objectives are changed. The total magnification set can be read off the nosepiece.



PERIPLAN eyepieces 10x M



Opak illuminator with revolving nosepiece and 5 objectives

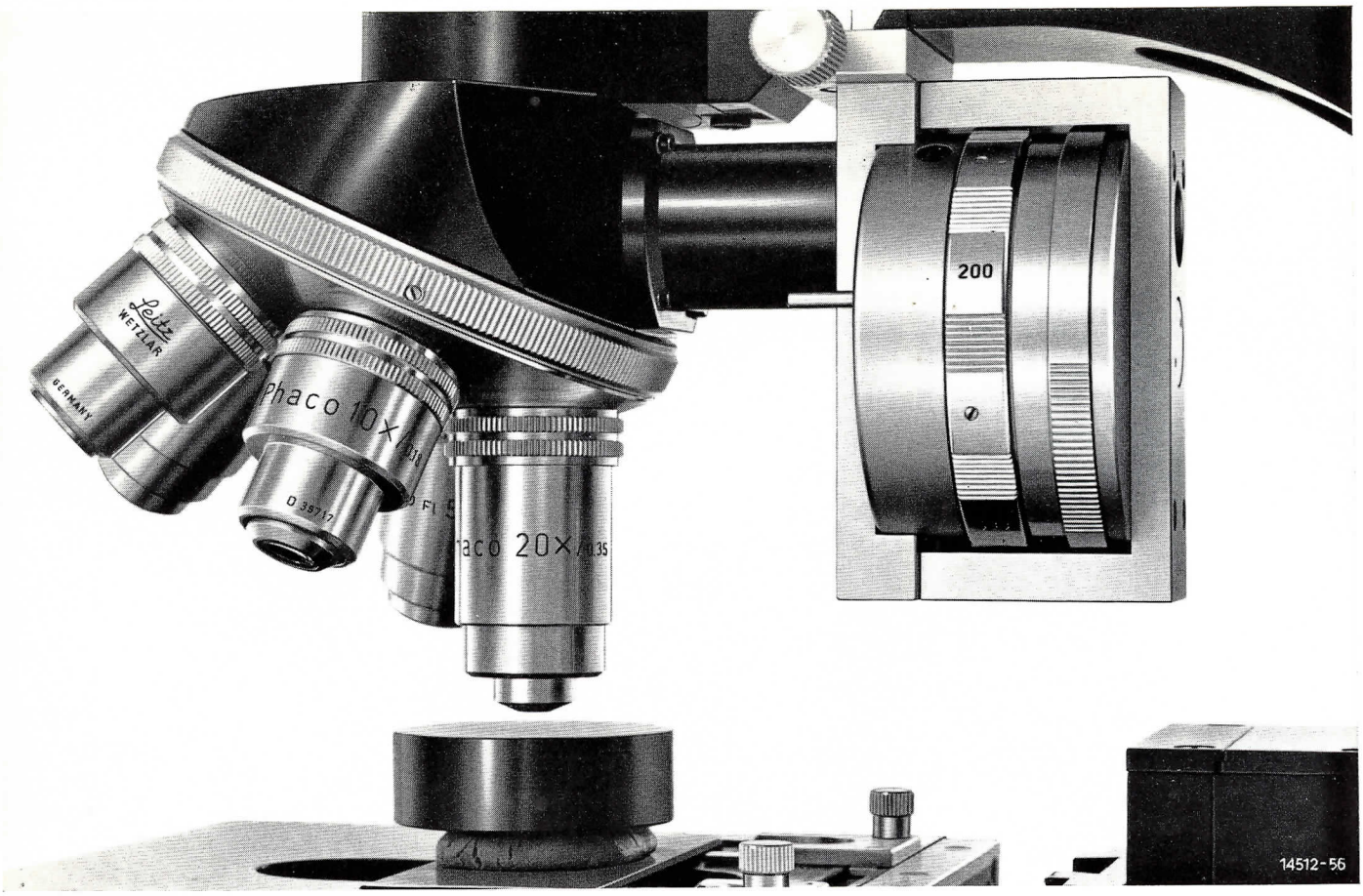
The METALLUX metallographic microscope provides the 50x, 100x, 200x, 500x, and 1000x standard magnifications laid down for material testing. They are used most frequently in metallography.
The Opak illuminator combined with the revolving nosepiece has a variable aperture diaphragm with scale, which can be used conveniently like a half-stop for setting up oblique illumination. It also includes an adjustable field diaphragm.
The eyepiece is a PERIPLAN 10x M, which has a graticule outlining the camera field of view and including a circle which corresponds to a picture area of 75mm diameter for examinations with the standard magnifications. Measurements can be carried out very easily with the PERIPLAN® 10x M eyepiece and a micrometer. For special problems all the other PERIPLAN eyepieces can be used, but it should be noted that the total magnifications will then no longer apply.



6.5x9cm camera

Photomicrography

An attachable 6.5x9cm camera is available for photomicrography; it includes a negative eyepiece, time- and instantaneous shutter, and a groundglass screen interchangeable with the darkslide. Bellows extension is unnecessary as the microscope is adjusted for the standard magnifications. Photomicrographs at 50x magnification should be focused on the groundglass screen; however, at magnifications from 100x to 1000x the photographs can be taken after focusing with an eyepiece without referring to the groundglass screen.
For serial photography the LEICA 35mm camera can be used in combination with the VISOFLEX® micro-mirror reflex attachment. The paper print enlarged to 6.5x9mm corresponds with the standard magnification of the microscope. Our outfit list contains detailed information about the various outfits.

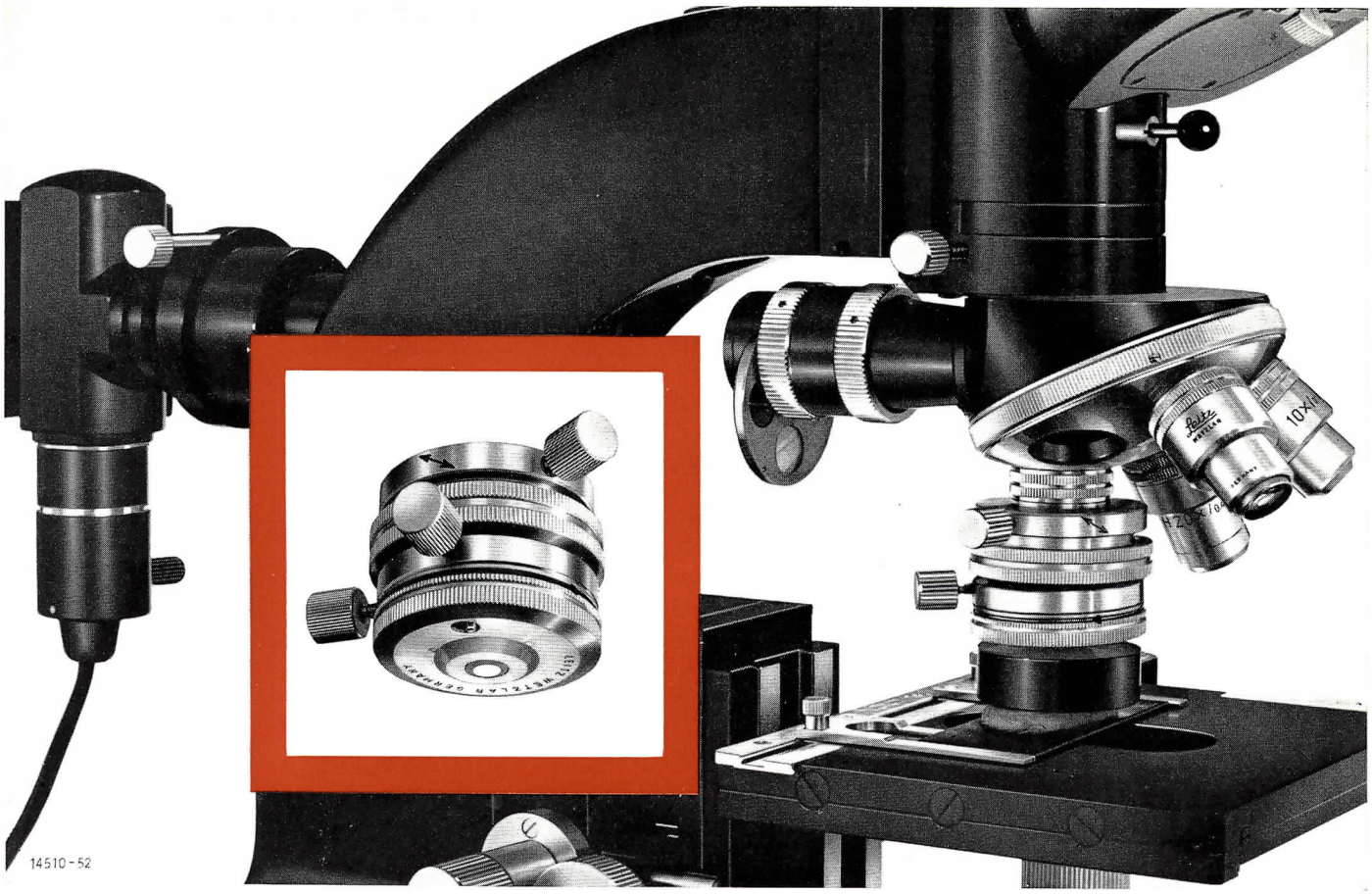


Phase contrast equipment
for the METALLUX

METALLUX metallographic microscope with phase contrast equipment

Phase-contrast microscopy in incident light is used mainly for investigating the fine structure of surfaces. In research and routine work in metallography and mineralogy, ceramics and petrography, and in the examination of corrosion, polishing, etching and tempering processes phase-contrast observation provides often rapid and sometimes even surprising results. Inclusions, compositions, grain boundaries, scratches, etching pits, etc., often almost invisible on unetched specimens in brightfield, stand out clearly and at full contrast. Phase contrast observation can provide interesting additional information especially on polished metal sections: where these consist of components of the same reflecting power the components will be indistinguishable in brightfield although their optical constants may be different. In phase contrast, however, differences in optical constants of metals usually produce phase changes of varying magnitudes during the reflection of light waves, which will be revealed as brightness contrasts.

The phase contrast equipment of the METALLUX includes:—
The Opak illuminator for phase contrast and brightfield illumination, 5 achromatic or apochromatic phase contrast objectives Phaco 5x/0.09, 10x/0.18, 20x/0.35, Fl 50x/0.85, Fl 100x/0.95.
The Opak illuminator has a rotating drum which includes 5 annular diaphragms for the various magnifications in phase contrast and one iris diaphragm for brightfield illumination. A device for the direct comparison of the phase contrast with the brightfield image is also incorporated. This provides the two most important items of information about the micro-structure of a surface: brightfield reveals the differences in reflectance of the structural details, phase contrast interprets the most minute variations in the height of the objects as brightness differences in the image.



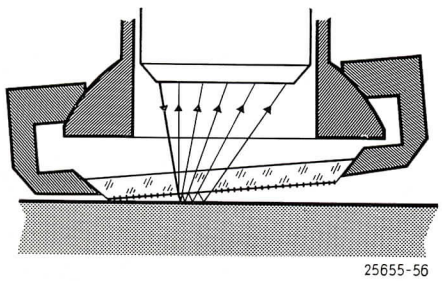
Incident-light interference attachment
on the METALLUX

LEITZ
incident-light interference attachment

In order to enable users of our metallographic microscopes to carry out interference microscopical surface measurements we supply, besides our special incident-light interference microscopes, an incident-light interference attachment based on the Tolansky multi-ray interference principle. This easily operated accessory can be used with our METALLUX, ORTHOLUX®, EPILUX-MET and PANPHOT®. It is eminently suitable for interference microscopical observations and measurements of natural surfaces, of electro-polished or cloth-polished unetched metallic or non-metallic sections, evaporated films, etc. It superimposes a system of interference bands on the microscopical image of the surface to be tested, the definition of the bands depending on the reflecting power of the testpiece and the reference surface.

The principle of the multi-ray interference

If a thin, semi-silvered glass plate is placed on a specular surface so that a thin, wedge-shaped layer of air is formed between the surface and the plate, and incident light illumination turned on, the rays passing through the plate from above will be reflected backwards, and forwards across the air wedge according to the reflecting power of the surfaces bordering on this air wedge. If monochromatic light of sufficient coherence is used for illumination, a family of sharp and very narrow interference bands depending on the number of effective reflections, becomes visible, and the number of the bands provides information about the wedge angle. Local changes in the level of the surface to be tested produce deflections in the interference bands; the difference in height can be deduced from the ratio of the deflection and the distance between the bands. The sharpness of multi-ray interferences, in certain conditions, allows very accurate depth determinations of object structures down to 10 A.U.



Advantages of the LEITZ incident-light interference attachment

Simple accessory for interference microscopical measurements in incident light.
Compact design
Sharply defined interference bands ensuring high measuring accuracy even of small differences in height
Easy orientation of the interference bands
Band system largely unaffected by vibrations
Wide adaptability to the most varied objects by means of reference surfaces of various forms and powers of reflection
Comparatively high magnifications and large apertures can be used
Sodium vapour lamp supplies monochromatic light of high coherence.

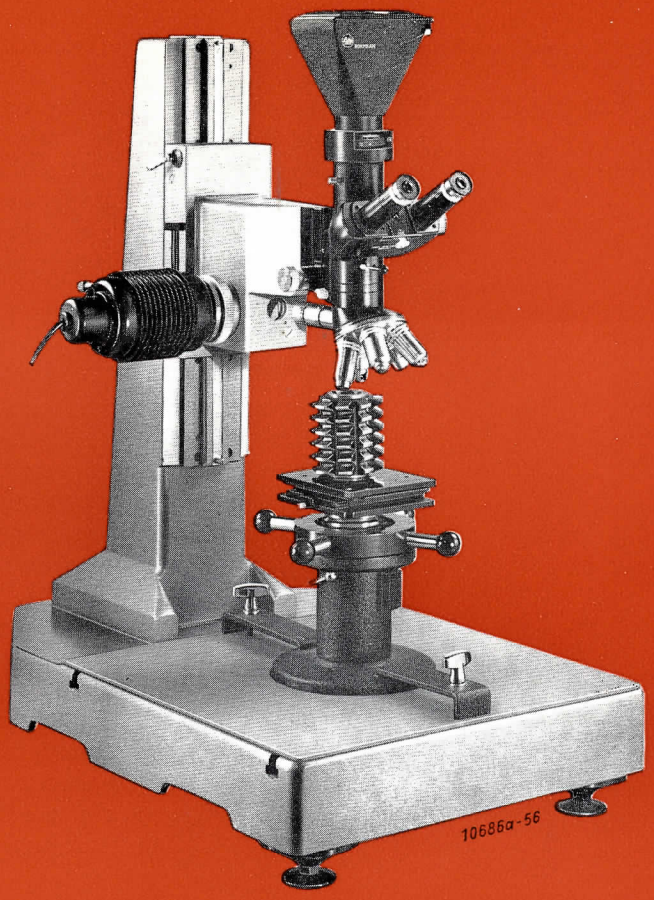
Brief technical description

The LEITZ incident-light interference attachment is used together with the 5x/0.09, 10x/0.18, H20x/0.40, and H32x/0.60 objectives. In order to ensure a reproducible fitting of these objectives, fitting mounts are supplied with the individual objectives which can rapidly replace the standard objective mounts. The interference attachment is designed so that the reference surface can be lowered on to the surface to be tested under constant control and without rotation until contact is made. Inclination and distance of the bands can be continuously changed by a controllable inclination of the reference plate. Reference plates of various forms and powers of reflection are available:—
Shapes: plane, spherical, cylindrical
Powers of reflection 15%, 40%, 75%.
A sodium vapour lamp in a small special housing is a source of highly monochromatic light of high coherence.

Microscopes for the non-destructive testing of materials

Through the development of modern electrolytic etch-polishing methods it has now become possible to examine even large workpieces or tools metallographically without the need of removing a sample. However, this non-destructive material test makes special demands on a microscope, which must be designed to take objects of the most varied shapes and sizes and also have facilities for reaching cavities and depressions of various depths in the workpiece.
To meet these requirements, two special stands of metallographic microscopes have been developed, which can be either fixed or portable.

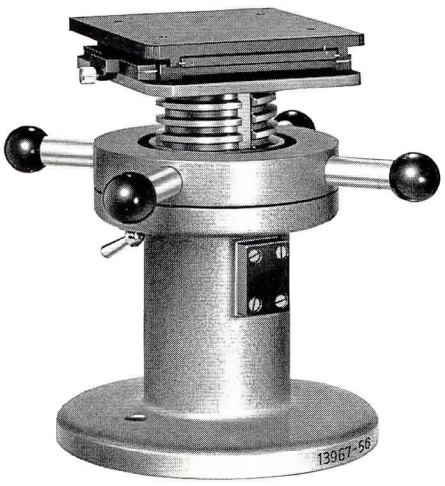
METALLUX ND



METALLUX ND metallographic microscope for non-destructive material testing

The METALLUX ND solves all the problems of investigation occurring in the practice of a large industrial plant. The large special stand accommodates heavy objects up to a total height of 37cm. The vertical construction of the microscope makes portions of the object normally reached only with difficulty accessible. The portion to be investigated faces the observer, and is indicated by a patch of light projected by the objective. Any part of the surface can thus be easily arranged for microscopical examinations. The range of magnifications includes the standard values of 50x, 100x, 200x, 500x, and 1000x.

The METALLUX ND is of course equally suitable for general metallographic purposes, i.e. the investigation of routine polished sections, for which a sliding object stage vertically adjustable and movable in all directions is available.



Support, 17cm high, for the examination of small objects

Brief technical description

41x41cm baseplate on vibration dampers. Two clamps hold mounting devices for small objects such as milling cutters, gears, wheels, firmly in position. A plate, height 3cm, with 3 clamping screws, covers the baseplate for the investigation of objects which need not be mounted.

A support, height 17cm, is available for the examination of small objects and samples; a 120x112mm sliding stage is mounted on the baseplate which is vertically adjustable by means of a helical gear. It accommodates medium-size objects up to 5kg in weight. The tubes, optical and photographic equipment are the same as for the METALLUX metallographic microscope. The light source is a 12v 60W low-voltage lamp which emits very bright light at colour temperatures from 2800° to 3400°K. It therefore meets all the demands of visual observation and photomicrography.

Workshop metallographic microscope

The portable special workshop metallographic microscope permits non-destructive material testing on the workbench. It is useful wherever transport to the inspection department is impossible or too cumbersome. The microscope can be placed on any large flat or cylindrical object. Full stability is ensured on flat or cylindrical surfaces by means of three mutually interchangeable feet. The microscopical image is observed binocularly. The magnification range includes the standard values from 50—500x. If the microscope is fitted with a binocular phototube, metallographic photomicrographs up to 200x will be possible.

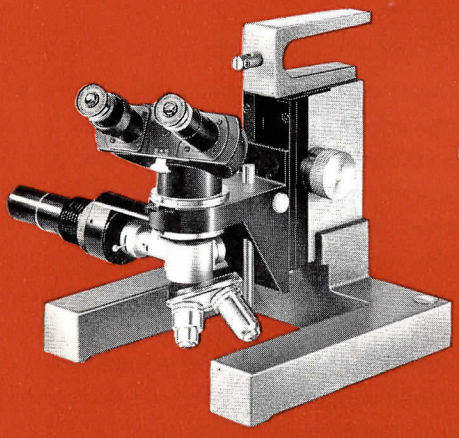
Brief technical description

The robust stand has a handle for convenient transport; it has changing devices for observation tubes and Opak illuminator. The image is focused with the single-knob mechanism which has proved very reliable on our large stands. One interval on the micrometer scale corresponds to 0.002mm in the fine adjustment, and to 0.025mm in the coarse adjustment range. A bore in the stand accommodates a dial scale for the measurement of etch depths.

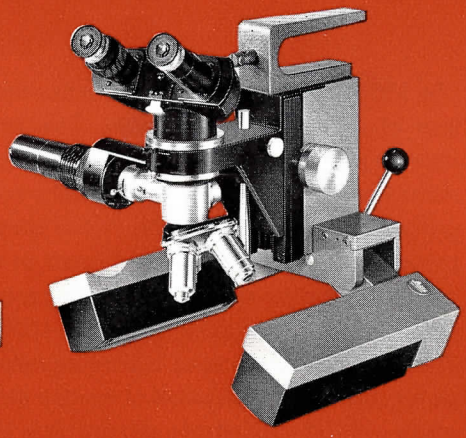
The inclined binocular tube S can be replaced by the phototube FS for binocular observation and photomicrography. Both tubes can be fully rotated.

The Opak incident-light illuminator with quadruple revolving nosepiece has an aperture- and a field diaphragm in the illuminating tube. The powerful 6v 15W lamp attachment ensures good image brightness and differentiation even at high magnifications. Lamp attachment and Opak illuminator form a fixed unit, but can be removed from the microscope together.

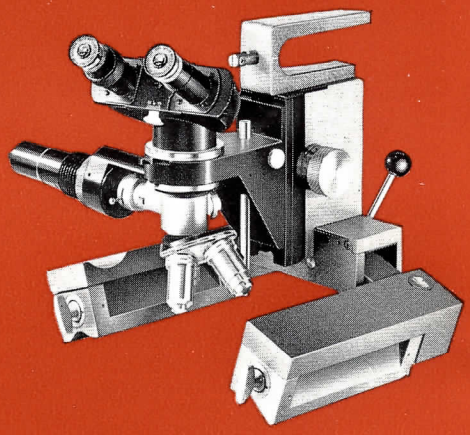
Objectives, eyepieces, and the photomicrographic equipment are the same as for our METALLUX metallographic microscope (most powerful objective 50x).



Workshop metallographic microscope with horseshoe foot



Workshop metallographic microscope with adjustable foot



Workshop metallographic microscope with adjustable foot and switching magnet device

Interchangeable feet

The stand can be fitted as required with a selection of the mutually interchangeable feet of which two can be adjusted so that the microscope stands firmly even on curved surfaces. The following types are available:—

Horseshoe foot

with wide base, non-adjustable, for placing on large, flat objects. Plastic three-point support, opening of horseshoe 160mm.

Adjustable foot

for placing on large, flat objects or cylindrical parts of 120mm minimum diameter. The bearing surfaces of the adjustable limbs are plastic-covered to protect the object surface from scratches.

Adjustable foot with switching magnet device

for investigations of large, flat or curved objects such as tubes, cylinders etc. With full magnet power minimum diameter of the curved surface 190mm, however, investigations of tubes down to 150mm diameter are possible. Free distance between the bearing surfaces of the adjustable limbs 180mm.

EPILUX-MET metallographic microscope



EPILUX-MET metallographic microscope with S-tube, mechanical stage No. 44, and Opak illuminator with quadruple revolving nosepiece and 6v 15W low-voltage lamp attachment in position

Leitz WETZLAR

The EPILUX-MET is a reasonably priced routine stand for metallographic work e.g. in acceptance and production control. Its optical equipment permits investigations at the standard magnifications between 50x and 500x in incident-light brightfield. Additional components convert the stand into a standard microscope for transmitted light.

Brief technical description

The robust stand has changing devices for observation tubes and Opak illuminator. As in our other large laboratory microscopes, the image is focused by means of a single-knob adjustment. The drive mechanism acts on the object stage, so that viewing level and tube inclination remain unchanged.

The stand can be fitted with monocular or binocular tubes (P, S, FS). The tube is attached with a single movement, and can be fully rotated as well as clamped in any position. The Opak illuminator with attached quadruple nosepiece, aperture- and field diaphragm is held in a dovetail guide and can be exchanged horizontally. The powerful 6v 15W lamp attachment ensures good image brigthness and differentiation even at high magnifications. Lamp attachment and Opak illuminator form a fixed unit. The optical outfit includes four achromatic and apochromatic objectives, 5x/0.09, 10x/0.18, 20x/0.35, FI 50x/0.85, and PERIPLAN eyepieces 10x M. The section on the METALLUX metallographic microscope on p. 5 contains detailed information about the optical equipment.

The object is placed polished face upwards on the square mechanical stage No. 44. The object slides are held by two stage clips. These can be removed, so that the entire stage surface of 120x112mm is available for the investigation of large metal samples.

Maximum vertical adjustment of the object stage: 45mm.

Traversing range of the object stage 70x70mm.

Our production programme includes:

Microscopes

Microscopes of the most advanced design for all investigations in transmitted, incident and polarized light

Microscope accessories, such as phase contrast equipment, Heating und cooling stages

Universal rotating stages

Special accessories for microscopy, e.g. micromanipulator, interference microscope, forensic comparison microscope binocular prism magnifiers, stereo-microscope

Photomicrographic apparatus

ORTHOMAT® fully automatic microscope camera

Microtomes of various designs

Ultra-microtome for electron microscopy

Physical research instruments based on optical methods

Infra-red spectrophotometer

Monochromators

E-photometer

Micro-refractometer

Instruments for routine dust measurements

Optical material testing instruments

Miniload hardness testers

Dilatometers

Heating microscopes

Optical-mechanical precision measuring instruments

Measuring microscopes

Angle measuring instruments

Telescopes for alignment and direction finding

Measuring and contour projectors

Surface measuring instruments

Optical installations and attachments for machine tools

Photographic equipment

LEICA® 35mm camera

LEICAFLEX® 35mm single-lens reflex camera

Accessories for scientific and technical photography

LEICINA® 8mm cine-camera

Projectors

Classroom projectors

Miniature projectors

PRADOVIT® automatic 35mm projector

Epidiascopes

Microprojectors, large lecture hall projectors

Binoculars

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