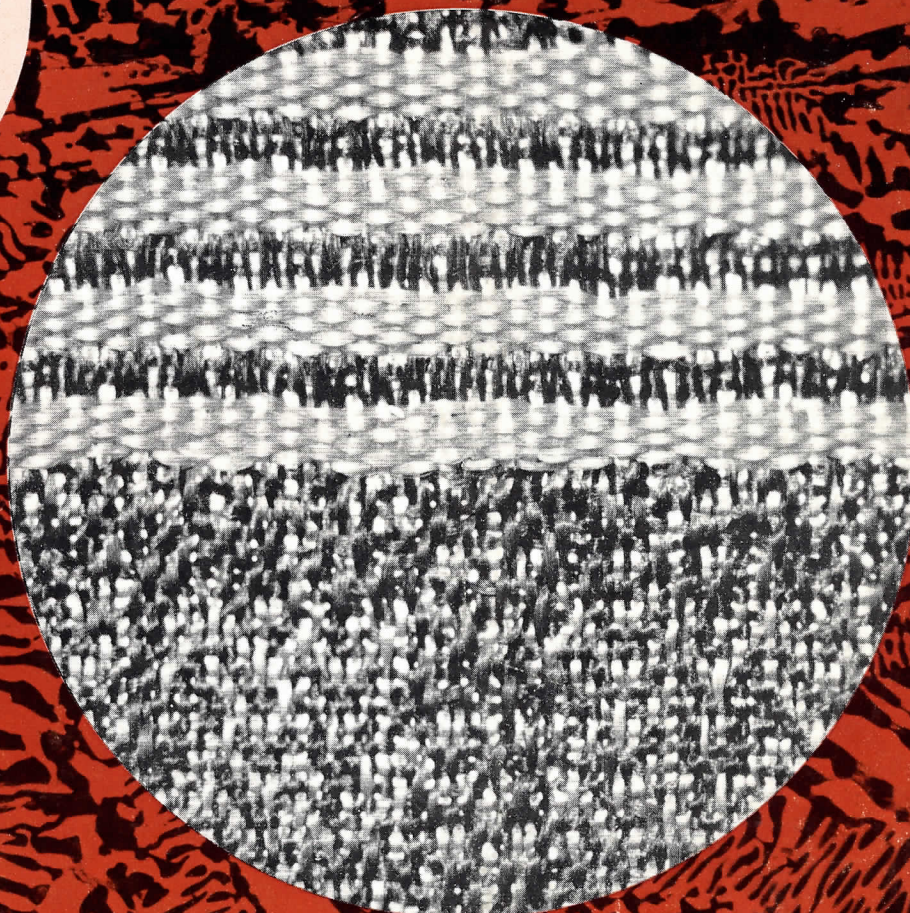




# Multipurpose Microscope,

with standard microscope components,

for high-power examinations in transmitted and incident light



## Application:

Top:  
Technical linear and angle  
measurements

Right:  
Surface structures in  
darkfield (fabric pattern)

Surrounding field:  
Metallographic surface  
investigations in  
brightfield (spiegeleisen)

# Multipurpose Microscope,

with standard microscope components

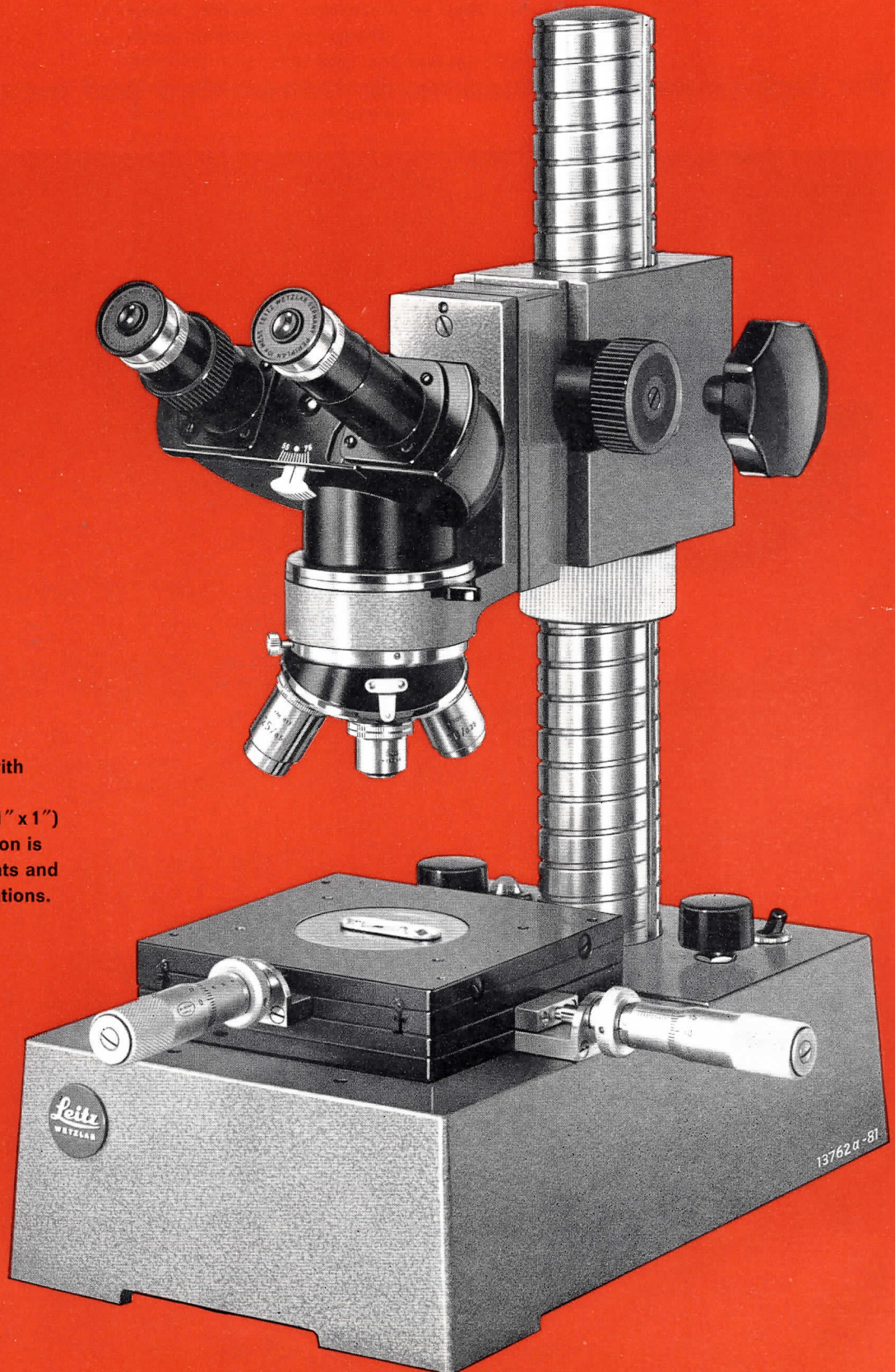


Fig. 1  
Multipurpose microscope with  
binocular tube S, revolving  
nosepiece and 25 x 25mm (1" x 1")  
measuring stage. This version is  
used for linear measurements and  
form tests at high magnifications.

# Uses

The multipurpose microscope with standard microscope components consists of individual structural assemblies which can be used in various combinations for widely differing tasks. The main applications of this instrument are technical linear and angle measurements and surface investigations.

Linear and angle measurements are possible at remarkably high magnifications (up to 500 x), generally impossible with the conventional measuring microscopes. The version of the instrument shown in Fig. 1 is therefore suitable for precision parts on which the most minute distances have to be measured and where the smallest deviations from standards have to be revealed (transistors, spinning nozzles, dies etc.).

Only a few manipulations are necessary to convert the multipurpose microscope for surface investigations in brightfield or darkfield (Figs. 8 and 10). The adaptability of the instrument to the height of the testpiece is a great advantage here. It is thus possible to carry out metallographic examinations on testpieces of up to 100mm height — e.g. also on tools — without the need for the cutting of samples (non-destructive material testing). The Opak vertical illuminator and the ULTROPAK<sup>®</sup> incident-light illuminator are available for investigations of this kind. Whereas the Opak illuminator is used mainly for metallographic examinations of polished sections (incident-light brightfield), the ULTROPAK (incident-light darkfield) permits in addition the investigation of natural surfaces such as varnishes, enamels, leather, and wood.

The multipurpose microscope is simple to operate and takes up little space. It can therefore be used directly on the workbench in the workshop. Most accessories can be ordered at a later stage, so that it is possible to extend the basic outfit for additional tasks as and when required.

To insulate the instrument against building vibrations an anti-vibration base is available.

## Characteristic features

**Adaptable for measurements in transmitted light (silhouette image), incident light (surface rendering), combined transmitted and incident light (silhouette image with surface rendering) as well as metallographic and other incident-light investigations.**

**Extension for the most varied tasks (unit system) since the microscope tubes, eyepieces, nosepieces, incident-light attachments are interchangeable.**

**High magnifications (up to 500 x) for technical linear and angle measurements.**

**Clear, brilliant image — the tubes, objectives, and eyepieces form part of the production programme of the LEITZ laboratory microscopes.**

**Single-knob control of coarse and fine adjustment ensures critical and rapid focusing.**

**Special tubes for photographic recording are available.**

**Space-saving design — transformers built into the base of the stand.**

**Conveniently and prominently arranged controls ensure comfortable operation.**

## Eyepieces



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Fig. 4 PERIPLAN widefield eyepieces GF 10 x

The tubes are available either with PERIPLAN® eyepieces or with PERIPLAN wide-field eyepieces (GF) as shown in Fig. 4. Especially during linear and angle measurements it is often necessary to survey large portions of the object; wide-field eyepieces are therefore most suitable for this purpose. Eyepieces to be used for measuring in combination with measuring stages must include crosslines for aligning the edge of the testpiece.

Two eyepieces can be supplied for linear and angle measurements; they can be inserted and clamped in the eyepiece tubes. Both have correction mounts, their scales can therefore be adjusted for optimum sharpness for any observer.

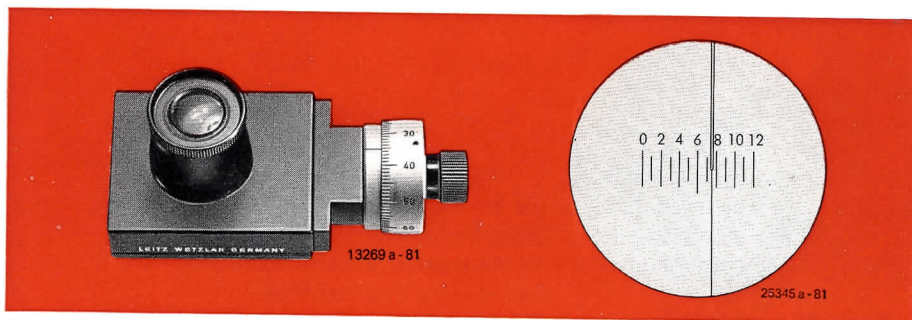


Fig. 5 Screw micrometer eyepiece

Fig. 5a Graduation in the intermediate image plane of the screw micrometer eyepiece.



Fig. 6 Angle measuring eyepiece with adjustable crosslines

The screw micrometer eyepiece shown in Fig. 5 permits linear measurements of short distances. The image of the testpiece is projected into the intermediate image plane and measured here. The measuring values can be determined with the scale shown in Fig. 5a and a measuring drum on the eyepiece. Scale unit and object field diameter always depend on the objective in the microscope (With the 10 x objective this is approx. 0.5  $\mu\text{m}$  and 1mm respectively). A stage determination of the scale unit.

**The angle measuring eyepiece with adjustable crosslines** (Fig. 6) is provided for angle measurements over a graduated range of  $\pm 90^\circ$ . It includes a glass plate with crosslines and  $30^\circ$  and  $60^\circ$  angles which by means of a knurled ring surrounding the eyepiece can be rotated through the entire range of the graduation (scale unit 20 min.). Since the crosslines are precisely vertical to each other and the angles exactly  $30^\circ$  and  $60^\circ$ , the quadrants without graduation can also be used for measuring, so that angles of up to  $360^\circ$  can be measured.



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Fig. 7 Revolving nosepiece

## Objective revolving nosepieces and objectives

If the multipurpose microscope is to be used exclusively for measuring and inspecting shapes in transmitted light, an outfit with the nosepiece for four objectives shown in Fig. 1 is perfectly adequate. The objectives suggested are spherically and chromatically corrected (achromats); their magnifications are 3.2 x, 10 x, 25 x and 40 x.

The revolving nosepiece (Fig. 7) is easily interchangeable against other objective carriers such as the ULTROPAC incident-light illuminator and the Opak illuminator.



## Incident-light attachments

Additional incident-light attachments open up further fields of application in microscopy. They also make portions of the testpiece which cannot be covered by the shadow image accessible for measuring and observation. Some outstanding examples are engravings, blind bores, shoulders, structures of unfinished surfaces and polished sections.

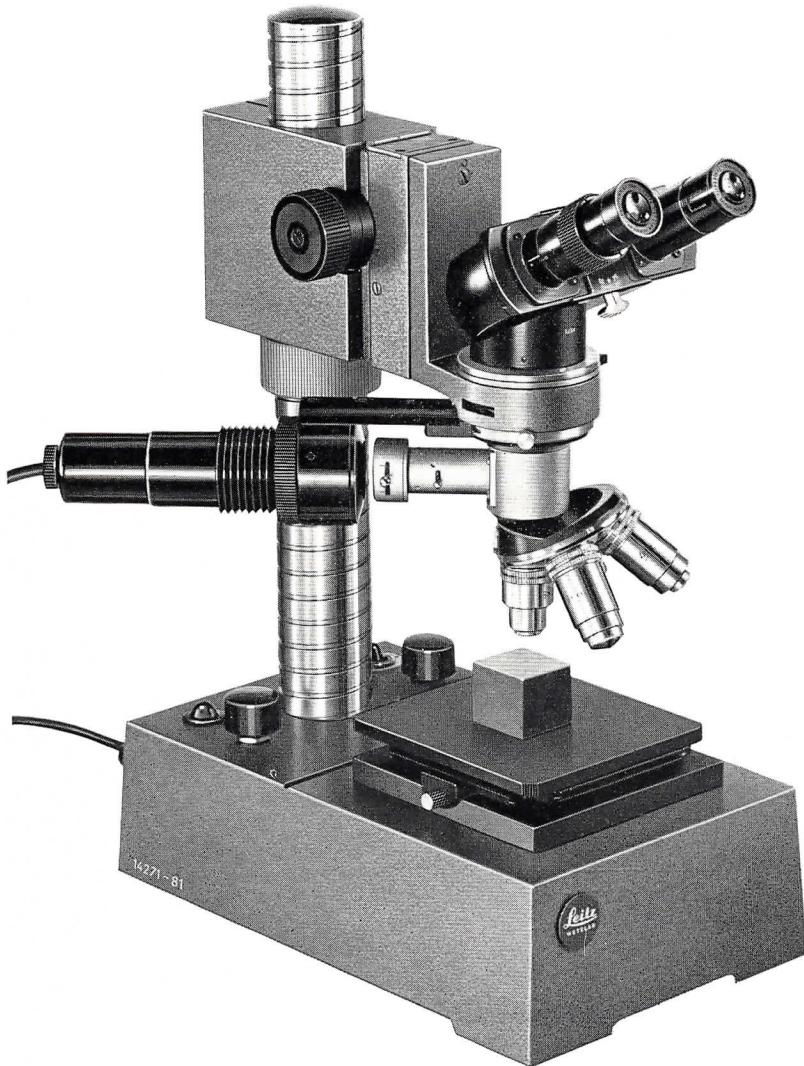


Fig. 8  
Opak illuminator  
on the multipurpose microscope  
with standard microscope  
components.

As mentioned before, the revolving nosepiece can be replaced on the carrying arm by the Opak illuminator or the ULTROPAK incident-light illuminator. These are used mainly for surface investigations. However, combined with measuring stages (p. 8) they can also be used for measurements in incident-light and — if the suitable stand is ordered with the built-in transmitted-light illuminator — in transmitted light. In this case they fulfil the function of the revolving nosepiece with its objectives described on p. 5.

All testpieces can be placed with the surfaces to be investigated upwards on the object- or measuring stage of the multipurpose microscope. This has some considerable practical advantages:

The full extent of the testpiece is visible even during microscopical examination. This ensures rapid and reliable orientation up to the edge of the testpiece, such as a polished section.

Locating certain portions of a preparation is made considerably easier, and the danger of overlooking important object portions such as large flaws, reduced. Damage of the surface which faces freely upwards is practically impossible.

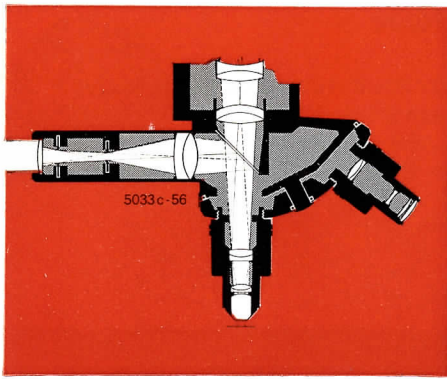


Fig. 9 Beam path in the Opak illuminator with special revolving nosepiece

The Opak illuminator (Fig. 8) is used especially for brightfield investigations of opaque objects with prepared surfaces, such as polished metal sections. It includes a 6 v 15 W low-voltage filament lamp which is connected to the mains through sockets in the base of the stand. A semi-reflecting plane glass in the illuminator housing above the objective deflects its light to the object, which is observed from above through this plane glass (Fig. 9).

The revolving nosepiece for four objectives is attached to the underside of the illuminator housing; it accepts the special Opak objectives of 5 x, 10 x, 20 x and 50 x magnification; they are parfocal, so that only minor focusing adjustment is necessary after a change of magnification.

The Opak illuminator has adjustable field- and aperture diaphragms. Filters can be inserted in a slot in the housing.

**The ULTROPAK incident-light illuminator** (Fig. 10) is used on the multipurpose microscope for the investigation of surface structures in incident-light darkfield. It permits examinations e.g. of metals, wool, silk, rayon, leather, wood, rubber, lignite, coal, varnishes, enamels, minerals and dressing products.

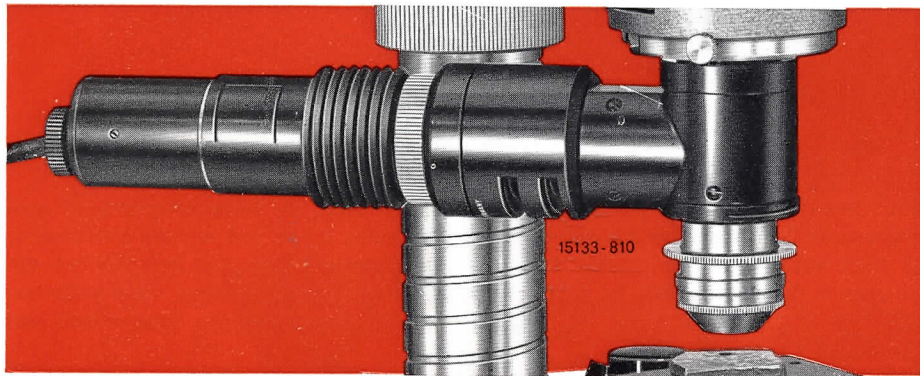


Fig. 10 ULTROPAK® incident-light illuminator on the multipurpose microscope with standard microscope components

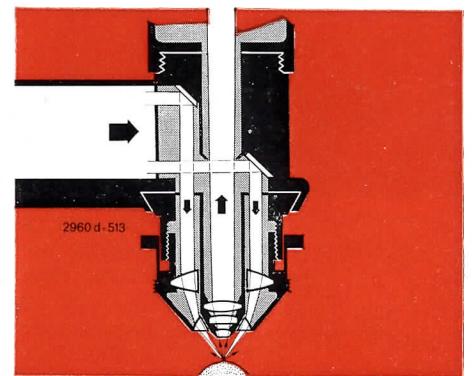
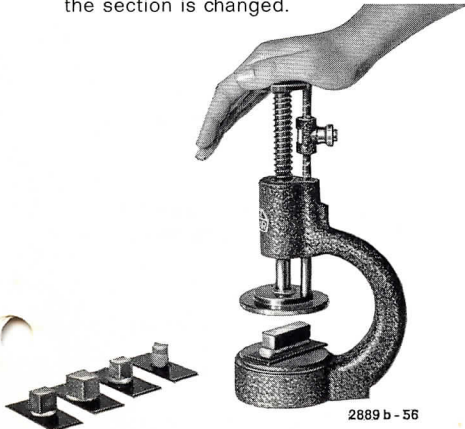


Fig. 11 Beam path in the ULTROPAK®

Fig. 12  
**Handpress** for levelling the polished sections embedded in plasticine. The adjustable stop serves to establish a standard height of polished surfaces, so that only minor focusing adjustments are necessary when the section is changed.



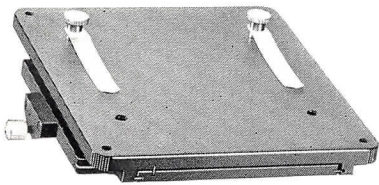
This attachment consists of the light source (6 v 15 W filament lamp), the housing with a fixed ring mirror, and an objective changing device. The light is conducted to the testpiece by the ring mirror and the condenser which surrounds the objective; the illuminating rays thus do not pass through the objective itself, only the light diffusely reflected by the object structure is used to form the image (Fig. 11).

The filter slots in the ULTROPAK accommodate polarizing filters for eliminating reflections, colour filters for photography, sector stops for obtaining special lighting effects.

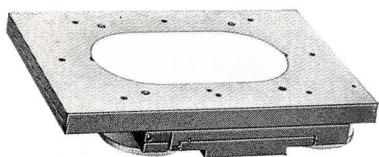
A series of objectives of primary magnifications ranging from 1,5 x to 50 x is available for the ULTROPAK; all have relatively long working distances, which permit the examination also of object parts of greater depth. The low-power objectives of up to 3,8 x have a fixed ring condenser; in the higher-power objectives this condenser is vertically adjustable. The optimum setting of the condenser depends on the surface properties of the object. An orientating scale makes all settings reproducible.

## Measuring stages and object holders

Rapid adjustments in the abscissa and ordinate directions are possible with the **sliding stage** and the **simple mechanical stage** (Figs. 13 and 14). While the sliding stage is suitable for incident light only, the simple mechanical stage has a central aperture and glass insert and can therefore be used with incident as well as with transmitted light.



Sliding stage for  
Fig. 13 incident light



Simple mechanical stage  
for transmitted- and  
Fig. 14 incident light

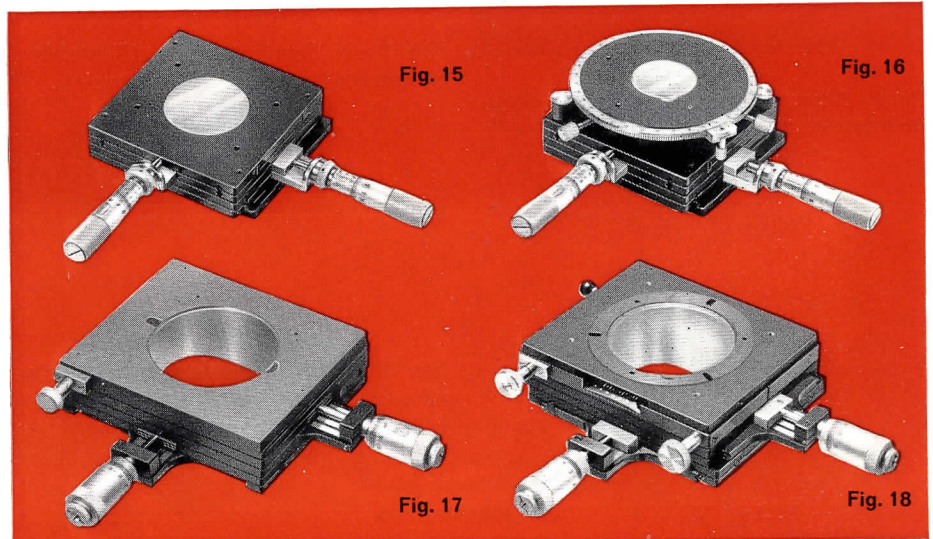


Fig. 15

Fig. 16

Fig. 17

Fig. 18

Fig. 15

25 x 25mm (1" x 1") measuring stage for  
transmitted- and incident light

Fig. 16

Attachable rotating stage on 25 x 25mm  
(1" x 1") measuring stage

Fig. 17

50 x 50mm (2" x 2") measuring stage for  
transmitted- and incident light

Fig. 18

50 x 50mm (2" x 2") measuring stage  
with built-in rotating stage

The measuring stages shown in Figs. 15, 17 and 18 have longitudinal and transverse ball tracks which permit relatively heavy loads and ensure movements of high accuracy. Their slides are held against the measuring spindles or slip gauges in both directions by spring traction. All measuring stages have a central aperture and a glass insert, so that they can be used both for transmitted and for incident light.

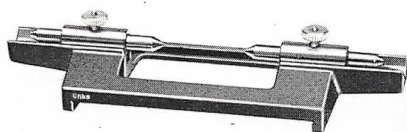
The **25 x 25mm (1" x 1") measuring stage** shown in Fig. 15 has a longitudinal and transverse travel of 25mm (1"). The entire measuring distance is covered by measuring spindles (scale unit 0.01mm or 0.0005"); slip gauges are therefore unnecessary. It is recommended to order the **attachable rotating stage**. In addition to angle measurements to 6 min. (vernier) it permits precision alignment of the test-piece with the stage movement. Its top is adjustable so that the apex of an angle to be measured can be rapidly centred in the tube.

The **50 x 50mm (2" x 2") measuring stage** shown in Fig. 17 has a longitudinal and transverse travel of 50mm (2"). 25mm (1" x 1") are covered by the measuring spindles (scale unit 0.01mm or 0.0005"); for longer distances slip gauges can be inserted between stage and spindle. The upper stage plate can be swivelled through  $\pm 15^\circ$  for the alignment of the testpiece.

The **50 x 50mm (2" x 2") measuring stage** (Fig. 18) allows additional angle measurements. It includes a **built-in rotating stage** which is read to 2 min. with a vernier.

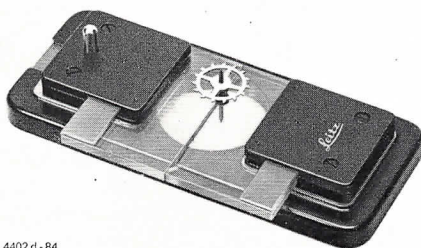
**Center cradles** (Fig. 19) are available for stages of all sizes for mounting cylindrical testpieces.

For small gears, etc., whose shafts must be vertical during measurement, the **holder for small parts** shown in Fig. 20 is suitable. It consists of a fixed and a movable glass plate, facing each other on a little baseplate. These holding plates have prismatic mounting slots of various sizes.



13254-81

Fig. 19 Center cradle



4402 d - 84

Fig. 20 Holder for small parts



## Photographic attachments

The practice of microscopy frequently calls for immediate photographic records of the findings, especially in the case of metallographic examinations with the multipurpose microscope. In order to accommodate various demands, two different outfits are offered with this type of microscope in combination with the binocular photo tube FS or the monocular tube O:

The **6.5 x 9 cm camera attachment** shown in Fig. 23 is recommended when photography is used only occasionally. It is placed on the microscope like an ordinary eyepiece; it is thereby centred and immediately ready for exposure. The microscopical image appears in the tube in full detail. The camera is fitted with a central shutter.



Fig. 21  
Micro-attachment for the LEICA®

Fig. 22  
MICROSIX®-L exposure meter

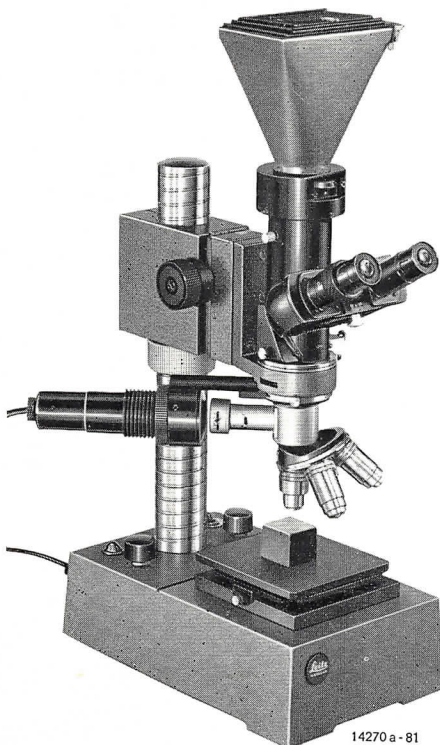


Fig. 23  
Multipurpose microscope, with standard microscope components, with 6.5 x 9cm camera attachment

The **micro-attachment for the LEICA®** (Fig. 21), on the other hand, offers the versatile technical possibilities and economic advantages of the 35mm technique. Its operation is simplicity itself: it is placed on the microscope, clamped in position, and the LEICA connected to the top of the micro-attachment. 75 % of the light flux are passed directly into the phototube; the remaining 25 % are completely adequate for observation in the focusing telescope. This makes the camera ready for operation at any time, with observation uninterrupted by the exposure. Index marks in the focusing telescope outline the camera field of view.

A vibration damper is built into the top part of the micro-attachment, preventing the transmission of the unavoidable vibration of the camera shutter to the microscope. Our list 54-22 contains further information about the micro-attachment.

The **MICROSIX®-L exposure meter** (Fig. 22) is recommended for measuring the exposure time. Its sensitivity is outstanding. Its long measuring range comfortably brackets all the exposure times likely to occur in photomicrography, and even with extreme values it will hardly ever be necessary to go to the upper or lower limit of the instrument. The measuring eye of the exposure meter can be permanently inserted in the lateral tube of the micro-attachment for the LEICA. Further details of the MICROSIX-L will be found in our List 54-22.





# Technical data for the multipurpose microscope with standard microscope components

<b>Stand and carrying arm</b>	Width	180mm	7.1"			
	Depth	286mm	11.2"			
	Height	420mm	16.5"			
	Mains connection adaptable for 110, 120, 130, 220, 230, 240 v a.c.					
	Transmitted light	7 v 2 W				
	Incident light	6 v 15 W				
	Distance between column and optical axis	approx. 115mm	4.5"			
<b>Transmitted-light objectives on the revolving nosepiece</b>	Reproduction scale	3.2:1	10:1	25:1	40:1	
	Aperture	0.12	0.25	0.50	0.65	
	Working distance metric (mm)	35	5.7	0.9	0.6	
	English (inch)	1.38	0.22	0.035	0.024	
	Object field diameter in the S tube with PERIPLAN wide field eyepieces metric (mm)	4.5	1.44	0.6	0.36	
	English (inch)	0.177	0.057	0.024	0.014	
	Maximum height of testpiece on the 25 x 25mm (1" x 1") measuring stage	approx. 120mm		4.7"		
	<b>Incident-light objectives for brightfield illumination (Opak illuminator)</b>	Reproduction Scale	5 x	10 x	20 x	50 x
		Aperture	0.09	0.18	0.35	0.85
		Working distance metric (mm)	12.7	13	1.2	0.3
English (inch)		0.5	0.51	0.047	0.012	
Object field diameter in the S tube with PERIPLAN wide-field eyepiece metric (mm)		3.6	1.8	0.9	0.36	
English (inch)		0.142	0.071	0.035	0.014	
Maximum height of testpiece on the 25 x 25mm (1" x 1") measuring stage		80-100mm		3.2-4"		
<b>Incident-light objectives for darkfield illumination (ULTROPAK incident-light illuminator)</b>		Objective and reproduction ratio	Working distance metric (mm)	English (inch)	Object field diameter* metric (mm)	English (inch)
		Sp UO 1.5:1	110	4.33	9.6	0.378
		Sp UO 2:1	90	3.54	7.2	0.284
	Sp UO 3:1	60	2.36	4.8	0.189	
	UO 3.8:1	33	1.3	3.8	0.15	
	UO 6.5:1	16	0.63	2.2	0.087	
	UO 11:1	5.7	0.22	1.3	0.051	
	UO 22:1	2.1	0.08	0.7	0.028	
	UO 32:1	1.0	0.04	0.5	0.02	
	UO 50:1	0.7	0.03	0.3	0.012	
Maximum height of the testpiece on the 25 x 25mm (1" x 1") measuring stage	approx. 110mm	4.3"	* with GF 10 x eyepiece			
<b>Sliding stage</b>	Longitudinal movement	70mm	2.75"			
	Transverse movement	70mm	2.75"			
	Support longitudinal	120mm	4.7"			
	transverse	112mm	4.4"			
	Height	29mm	1.15"			

<b>Simple mechanical stage</b>	Longitudinal movement	55mm	2.2"
	Transverse movement	45mm	1.8"
	Support longitudinal	180mm	7.1"
	transverse	120mm	4.7"
	Height	44mm	1.7"
<b>25 x 25mm (1" x 1") measuring stage</b>	Longitudinal measuring range	25mm	1"
	Transverse measuring range	25mm	1"
	Scale unit of the measuring drums	0.01mm	0.0005"
	Diameter of the stage aperture	50mm	2"
	Support longitudinal	120mm	4.7"
	transverse	120mm	4.7"
	Height	32mm	1.27"
<b>Attachable rotating stage for the 25 x 25mm (2" x 1") measuring stage</b>	Rotating range	n · 360°	
	Vernier reading to	6 min.	
	Diameter of the support	116mm	4.6"
	Diameter of the stage aperture	40mm	1.58"
	Height	27mm	1.06"
<b>Center cradle for the 25 x 25mm (1" x 1") measuring stage</b>	Maximum distance between centers	110mm	4.3"
	Maximum workpiece diameter for a length of 90mm (3.55")	44mm	1.73"
<b>50 x 50mm (2" x 2") measuring stage</b>	Longitudinal measuring range	50mm	2"
	Transverse measuring range	50mm	2"
	Scale unit of the measuring drums	0.01mm	0.0005"
	Swivelling range of the stage plate	± 15°	
	Diameter of the stage aperture	95mm	3.7"
	Support longitudinal	180mm	7.1"
	transverse	155mm	6.1"
	Height	56mm	2.2"
<b>50 x 50mm (2" x 2") measuring stage with built-in rotating stage</b>	Longitudinal measuring range	50mm	2"
	Transverse measuring range	50mm	2"
	Scale unit of the measuring drum	0.01mm	0.0005"
	Rotating range	n · 360°	
	Vernier reading to	2 min.	
	Diameter of the stage aperture	95mm	3.7"
	Support longitudinal	180mm	7.1"
	transverse	155mm	6.1"
	Height	56mm	2.2"
	<b>Center cradle for the 50 x 50mm (2" x 2") measuring stages</b>	Maximum distance between centers	150mm
Maximum workpiece diameter for a length of 110mm (4.3")		60mm	2.36"
<b>Holder for small parts</b>	Length	140mm	5.5"
	Width	60mm	2.4"
	Height	20mm	0.8"
	Shaft diameter of the object min.	0.2mm	0.008"
	max.	4mm	0.16"

**Our production programme  
also includes:**

**Microscopes for linear and angle measurements**  
**Optical linear measuring instruments with mechanical tracing**  
**Linear measuring instruments for statistical quality control**  
**Angle measuring instruments**  
**Telescopes for alignment and direction finding**  
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