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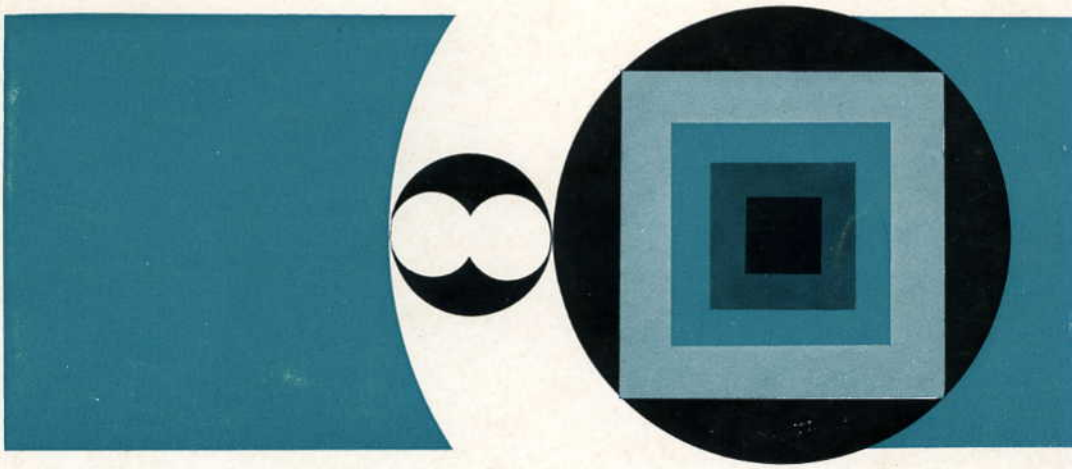
CARL ZEISS

Stereomicroscope I
Stereomicroscope III

Operating Instructions



47 50 00

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47 50 11

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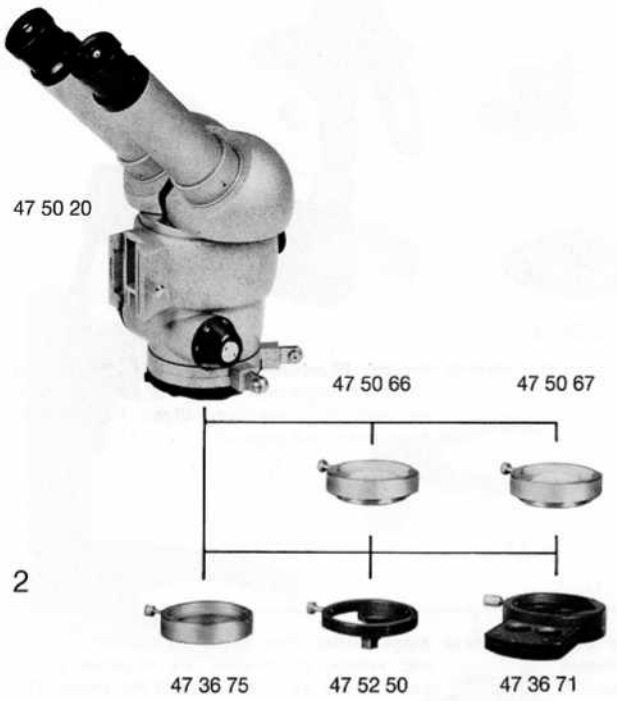
Stereomicroscope I

47 50 00 **Stereo tube I,** for attachment to stand or, with intermediate piece with rack and pinion (47 52 10), to table stands (pages 16–18). Equipped with rotatable lamp holders for two vertical illuminators.

Interchangeable paired objectives

47 50 10 paired 0.63× objectives
47 50 11 paired 1.0 × objectives
47 50 12 paired 1.6 × objectives
47 50 13 paired 2.5 × objectives
47 50 14 paired 4.0 × objectives
47 50 15 paired 6.3 × objectives
47 50 16 paired 10 × objectives

2



Stereomicroscope III

47 50 20 **Stereo tube III,** with built-in paired pancratic (zoom) objectives for continuously variable magnification. Attachable to stand or, with intermediate piece with rack and pinion (47 52 10), to table stands (pages 16–18). Equipped with rotatable lamp holders for two illuminators.

47 50 66 **Attachment objective 2×** doubles magnification and aperture of the microscope and halves the object field diameter.

47 50 67 **Attachment objective 0.5×** (for use with table stands only) halves magnification and aperture of the microscope and doubles object field diameter. The working distance is increased to 5 in. (127 mm).

47 36 71 **Analyzer** — when clamping it to an objective or to attachment objective 2×, have the slide point towards the stand. 4× eyepieces cannot be used because of vignetting. See also p. 14.

47 36 75 **Simple analyzer,** used in conjunction with polarizer to eliminate reflections in the specimen under vertical illumination. Clamp analyzer to objective or attachment objective and insert filter polarizer 32 mm diameter (47 36 00) in the filter holder of the illuminator (heat-absorbing filter!). Rotate the two filters in opposite directions until the reflections disappear.

47 52 50 **Prism for vertical illumination** reflects the light from the illuminator into deep-lying areas of the specimen. Evenly illuminated field without attachment objective: 26×26 mm. At low magnifications (with 10× eyepieces up to a magnification factor of 2) on the dial vignetting will occur. The prism should be clamped to the objective or attachment objective with the holder pointing toward the table stand to prevent partial obscuring of the objective aperture. The bulb filament should be imaged on the prism surface to allow the largest possible amount of light to pass through the small prism.

3

49 50 57 **Vertical illuminator** for incident light. With insert for transmitted light (47 52 60) it can also be used for trans-illumination. For detailed description, see page 12.

Stages

47 52 20 **Simple circular stage.** For incident light it is inserted into the base of the stand; for incident and transmitted light into the stage carrier (47 52 30). With the stage comes a black/white metal plate insert and a ground-glass plate frosted on one side which can be exchanged for special inserts.

47 52 22 **Gliding stage** for displacing the specimen by hand – to be attached to the stand in the same manner as the simple circular stage. The rotatable frosted-glass stage top can be displaced 9 mm from the center in any direction.

Inserts for simple circular stage

47 52 24 V-bearing, for cylindrical objects. It can also be inserted from below if the microscope is to be placed on top of such objects (page 13).

47 52 25 Ball stage, can be rotated and tilted in the carrier ring together with the specimen, for observation by transmitted and reflected light.

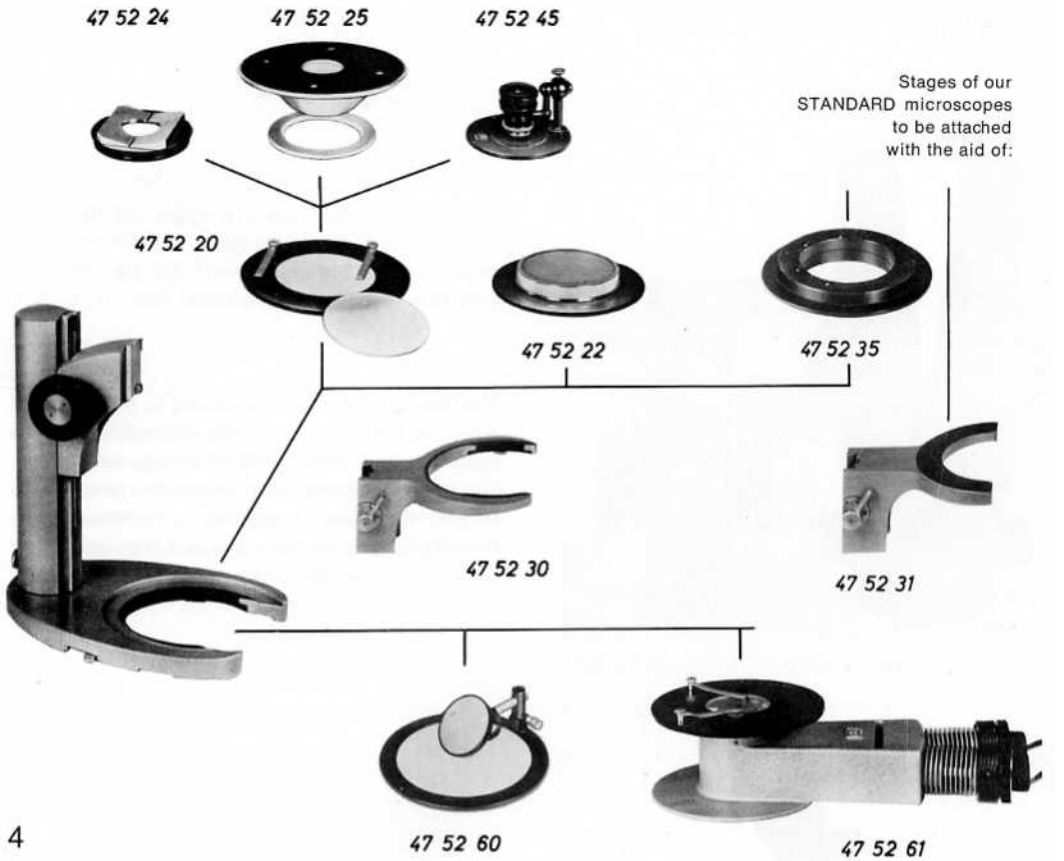
47 52 45 Holder for jewel bearing chuck with chuck I (47 52 46) – for specimens from 3 to 6 mm in diameter – or chuck II (47 52 47) – for specimens from 1 to 4 mm in diameter. The chucks can be tilted. The three prongs which hold the specimen can be opened by pressure on the surface of the holder.

47 52 30 **Stage carrier.** The stages for transmitted light and vertical illumination are mounted in the carrier same as in the base of the stand. The stages are clamped by means of a screw projecting on the underside.

The stages of our STANDARD microscopes can be attached with the aid of:

47 52 31 **Microscope stage carrier.** Screw the stage firmly to the carrier and attach to the stand. Perfectly smooth rotation of centerable microscope stages is guaranteed.

47 52 35 **Microscope stage holder.** The stage is screwed to the stage holder and then attached to the stand in the same manner as the simple circular stage (47 52 20). First fit the large mechanical stage to the stage carrier (47 52 30), then attach to the stand. The mechanical stage can be oriented properly in the base of the stand only when the eyepieces are turned away from the column. The stages of our STANDARD microscopes are described in operating instructions G 40–114.



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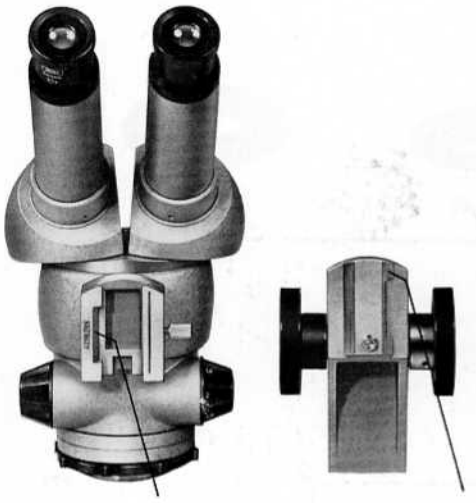
47 52 60 **Insert for transmitted light** contains a polished concave mirror and a frosted plane surface (diffuse light). For low magnifications direct the illuminator at the bright surface which reflects the light to the specimen. Swing the mirror out of the way. Transmitted light for higher magnifications can be obtained with the mirror in place.

47 52 61 **Special illuminator for transmitted light** produces a permanently centered continuous light beam and is particularly advantageous at high magnifications. A separate low-voltage lamp is used for each component image. The illuminated object field is 45 mm in diameter. The filter holder supplied with the illuminator accepts twin light filters. The upper side of the illuminator is designed as a stage onto which either spring clips or the attachable mechanical stage (47 33 25) can be mounted.

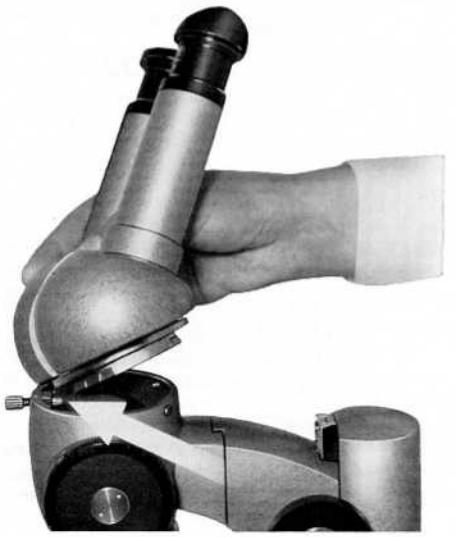
The special illuminator is inserted into the base of the stand and rotated 90 o until it stops. It is clamped in this position by the lever in the base (Fig. 13).

Assembly



5

The stereo tube can be attached to the rack and pinion of the stand (or to the intermediate piece with rack and pinion) after the clamping screw has been loosened. First insert the stereo tube so that the guide b engages the recess a. Then slide it down to the stop and lock it by tightening the clamping screw.



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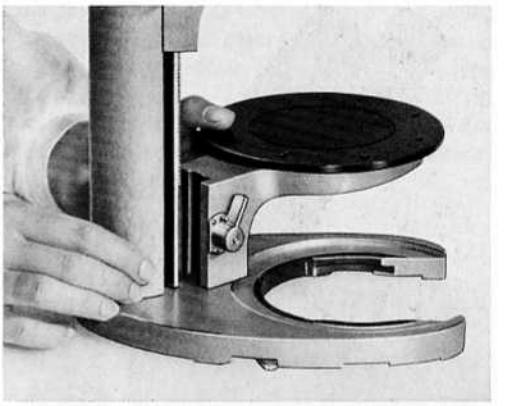
Stereomicroscope I only

To attach the inclined binocular tube loosen the clamping screw at the spring bolt. Push the spring bolt (arrow in Fig. 6) back with the dovetail ring of the tube and insert tube fully. The binocular tube can also be attached in reverse position (e. g. for use with stages in the base of the stand).

To insert the stage into the base of the microscope or into the stage carrier, red dot must be opposite red dot. Then rotate the stage approximately 90° and fasten with the lever or clamping screw.

Attach the stage carrier by inserting the edge opposite the clamping lever into the dovetail of the stand (Fig. 7). Then swing the carrier towards the stand until the spring bolt engages the dovetail. Turn the clamping lever to lower position to lock the stage carrier in place.



7

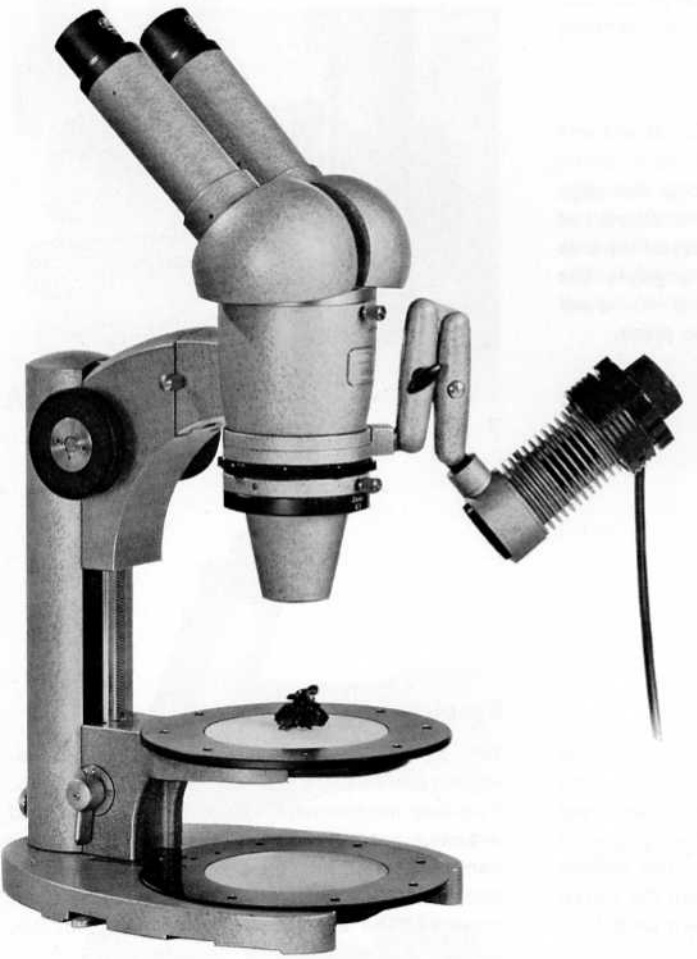
Focusing

The chrome ring on the spindle of the focusing knobs slows down the focusing motion. The accessory pin should be inserted into one of the holes in this ring. Counterclockwise turning of the ring increases the tension. **The motion should be just stiff enough to prevent the stereo tube from sliding down under its own weight.**

Eyepieces

10× and 25× eyepieces are available as focusing eyepieces to compensate for visual defects. Eyepiece micrometers, eyepiece cross-lines, and eyepiece net micrometers of 22.5 mm diameter can be inserted into the black insert at the lower end of the eyepiece after this insert has been removed. The eyepieces are locked in position by means of the eyepiece clamping ring 46 49 12.

The eyepieces should always be left in the tube in order to keep out dust.



8 Stereomicroscope I set for vertical illumination

Stereomicroscope I

As in conventional microscopes, the magnification of the Stereomicroscope I is determined by multiplying the ratio of reproduction of the objectives by the magnification of the eyepieces (see table).
As in all stereomicroscopes, the image is upright and unreversed.

Exchange of paired objectives

Hold the objective at an angle against the underside of the intermediate tube. Push the spring bolt back until the objective can be fully inserted.

Low-power paired objectives have a working distance (edge of objective to specimen) of 85 mm. With the 4.0× objectives, the working distance is 65 mm,
with 6.3× objectives 43 mm,
with 10× objectives 28 mm.

Magnifications

Paired objectives	with eyepieces		
	4×	10×	25×
	imaged field diameter (mm)		
0.63	**2.5×** 48 mm	**6.3×** 32 mm	**16×** 16 mm
1.0	**4×** 30 mm	**10×** 20 mm	**25×** 10 mm
1.6	**6.3×** 18,5 mm	**16×** 12.5 mm	**40×** 6 mm
2.5	**10×** 12 mm	**25×** 8 mm	**63×** 4 mm
4.0	**16×** 7.5 mm	**40×** 5 mm	**100×** 2.5 mm
6.3	**25×** 5 mm	**63×** 3 mm	**160×** 1.5 mm
10	**40×** 3 mm	**100×** 2 mm	**250×** 1 mm

9 Stereomicroscope III set up for trans-illumination with insert for transmitted light

Stereomicroscope III

Shifting of some of the lens elements in the pancratic (zoom) objectives causes the zoom effect. This is achieved by turning one of the black control knobs located on either side of the tube body. The initial magnification factors are engraved on one of these knobs. The knobs have slight click stops for each magnification. The chosen magnification multiplied by the magnification of the eyepiece used gives the total magnification of the microscope. For focusing it is best to start with an initial magnification of 4×. The image will remain in sharp focus over the entire range of magnification, provided the observer has emmetropic eyes accommodated for infinity.

The following table lists the magnifications to be obtained with our eyepieces. This range can be extended from 2× to 200× by means of the attachment objectives 0.5× and 2×.
Without the attachments, the working distance (edge of objective to specimen) is approximately 75 mm; with attachment objective 2× approx. 23 mm; and with attachment objective 0.5× approx. 127 mm.
After loosening a black knob on the tube carrier, the stereo tube can be rotated and clamped in any desired position. However, it cannot be removed.
The Stereomicroscope III gives an upright and unreversed image.

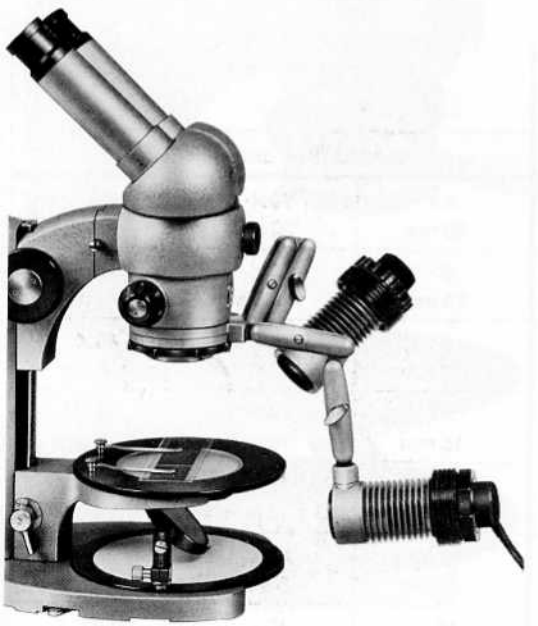
Magnifications

Initial magnification of objective	with eyepiece		
	4×	10×	25×
	imaged field diameter (mm)		
1	**4×** 30 mm	**10×** 20 mm	**25×** 10 mm
1.2	**5×** 25 mm	**12×** 16.5 mm	**30×** 8 mm
1.6	**6.3×** 18.5 mm	**16×** 12.5 mm	**40×** 6 mm
2	**8×** 15 mm	**20×** 10 mm	**50×** 5 mm
2.5	**10×** 12 mm	**25×** 8 mm	**63×** 4 mm
3.2	**12.5×** 9 mm	**32×** 6 mm	**80×** 3 mm
4	**16×** 7.5 mm	**40×** 5 mm	**100×** 2.5 mm

Illumination

Stereomicroscopes I and III can both be equipped with two illuminators each. The two holding rings can be rotated independently of each other and clamped by means of the black ring above the objective. The lamp holder moves on a pair of tapers on the holding ring onto which it is slipped.

If the illuminator is added later by the customer: First loosen the slotted screw opposite the thumb screw. It has a **left-hand thread** (loosen it in the direction in which a screw is normally tightened). Then loosen the thumb screw sufficiently so that the lamp holder can be slipped over the pair of tapers. Tighten the thumb screw only slightly at first and screw the slotted screw back in. The ease of movement of the joints can now be controlled by means of the thumb screw.



10 Combined vertical trans-illumination

To adjust the illumination, point the illuminator beam at the specimen or the mirror and move the lamp socket within the lamp housing until the specimen is illuminated as brightly and uniformly as possible. The black clamping ring on the lamp housing releases the socket when the two red dots face each other.

After inserting the 6 V 15 W low-voltage bulb (Cat. No. 38 01 79) into the socket, wipe off all finger prints. Then slip the light shield onto the bulb for glare protection. Be sure always to connect the lamp via a suitable transformer. Our plug-in transformer can be set to 110 – 125 – 220 – 240 volts after removing its base plate, and it has taps for 2.5 – 3.5 – 4.5 – 5.5 – 8 volts. It is usually sufficient to operate the bulb at lower than rated voltage, which considerably increases its life span.

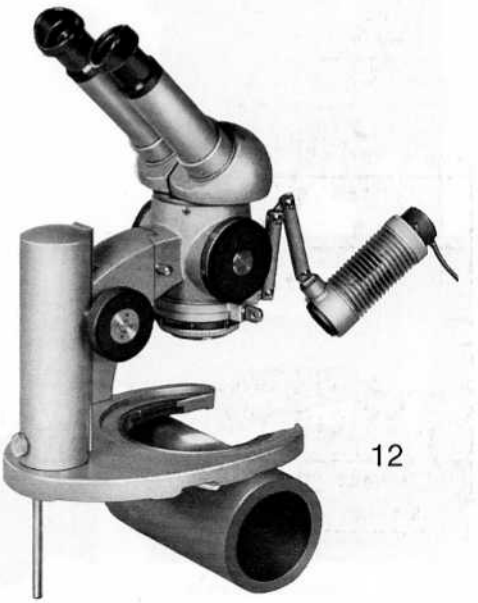
The bulb should always be protected against shock – particularly when it is in operation – since its filament is very delicate. It must light up as soon as the transformer is switched on.

If a light filter (32 mm diameter) is to remain permanently in the light path (a heat-absorbing filter for instance), unscrew the lamp housing with its cooling fins from its lamp holder and insert the filter into the lamp holder.

In order to exchange filters during observation, a filter holder (Cat. No. 46 60 50) can be attached. Whenever the filter polarizer (47 36 00) is used, a heat-absorbing filter should be inserted in front of the lamp, as described above.

11

Dissection work is facilitated by adjustable hand rests (47 52 68). The hand rests can be tilted, rotated, and adjusted for height. The hand rests proper are mounted eccentrically on a ball joint.

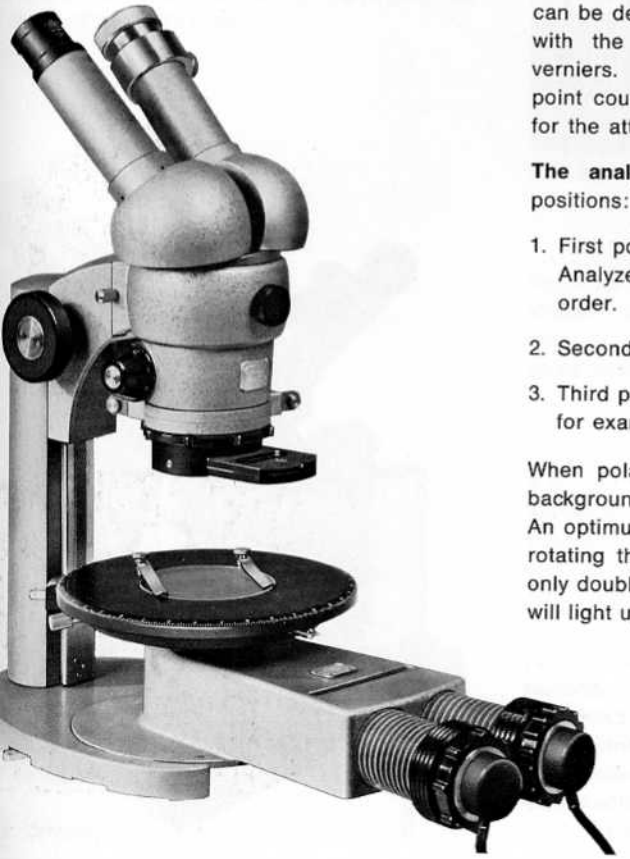


12

The Stereomicroscope can be placed directly on **large objects.** Its base has lateral recesses to ensure the perfect seating on cylindrical objects. With the aid of the extension rod of 6 mm dia. contained in the stand, the microscope can be placed on top of objects up to a diameter of 120 mm.

Stereomicroscope III POL

n addition to simple observations in polarized ght, the Stereomicroscope III can also be used or **measurements** in transmitted light (using the rthoscopic light path), such as the determi- ation of optical characteristics, of the angle at vhich extinction occurs, or of the principal irections of optical anisotropy, etc.



The special illuminator for transmitted light POL guarantees sufficient brightness of the image (see description 47 52 61, page 5). A centerable circular rotating stage moves on ball bearings. A vernier scale permits angles to be read to $^1/_{10}$°. A polarizer is built in below the stage top. The central opening of the stage is fitted with a cover glass 2 mm thick (47 52 92).

The specimen is displaced by means of the attachable mechanical stage POL (47 32 45) which is fitted to the stage top with two pins and a screw. The stage's range of movement is 20×25 mm. The coordinates of a point on the specimen can be determined with an accuracy of 0.1 mm with the aid of millimeter graduations and verniers. For quantitative determinations the point counter attachment (47 40 35) is available for the attachable mechanical stage POL.

The analyzer can be set in the following positions:

1. First position (marked γ):
   Analyzer combined with quartz plate red first order.
2. Second position: Analyzer alone.
3. Third position: Unobstructed passage of light for examinations in plane-polarized light.

When polarizer and analyzer are crossed, the background of the field of view appears dark. An optimum setting can be obtained by slightly rotating the tube or the analyzer. In this case only doubly refracting elements of the specimen will light up when the stage is rotated.

An eyepiece with focusing eyelens which contains a cross-line graticule is required for polarizing microscopy. First point the eyepiece at a bright surface and screw the eyelens in until the cross line is just in sharp focus. Then adjust the tubes to suit the interpupillary distance and orient the cross line parallel to the vibration direction of the crossed polarizers. This is done with the aid of the supplied anhydrite test slide in the manner described below and familiar to every mineralogist.

Adjustment of cross-line graticule in relation to vibration direction of light

1. Set eyepiece tubes to interpupillary distance and switch on illuminator.
2. Attach analyzer in viewing direction (see Fig. 13) and move analyzer to second stop position.
3. Adjust to optimum darkness of field background by slight rotation of tube or analyzer. Lock in this position.
4. Place anhydrite test slide on stage and rotate stage until test slide is dark, too.
5. Move analyzer out of beam and orient the vertical cross line to any long, clearly visible crack in the test slide by rotating the eyepiece (not the eyelens) (see Fig. 15).
6. Lock eyepiece in this position by means of clamping ring.

If another observer readjusts the interpupillary distance of the binocular tube, the position of the cross line must also be readjusted, since the eyepiece tubes are slightly rotated in the process.

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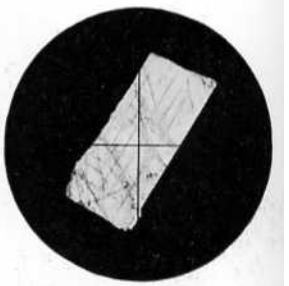

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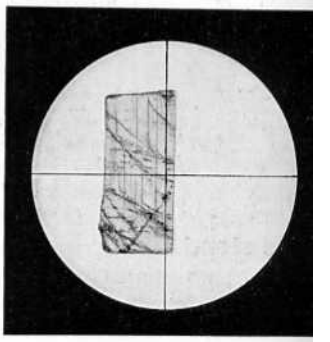
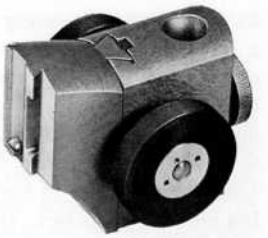


Anhydrite test slide used for adjustmen

Table stands

Mounted on table stands, Stereomicroscopes I or III can be set to and swung over specimens of different height, within a wide range. The collar on the column supporting the horizontal arm can be adjusted for the height of the specimen. The horizontal arm can be shifted axially. It is secured against turning about its axis and can be locked in any position.



16

The intermediate piece with rack and pinion 47 52 10 connects the stereo tube to the table stand. The intermediate piece with rack and pinion with a setting range of 50 mm is slipped onto a rod of 18 mm dia. and locked in position. The pinion drive has stops on either end.

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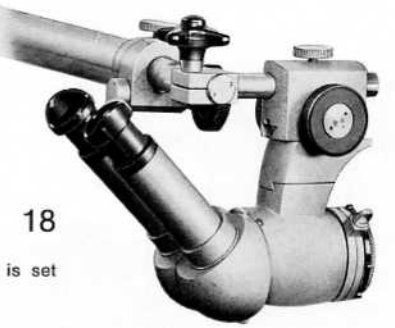
Table stand J

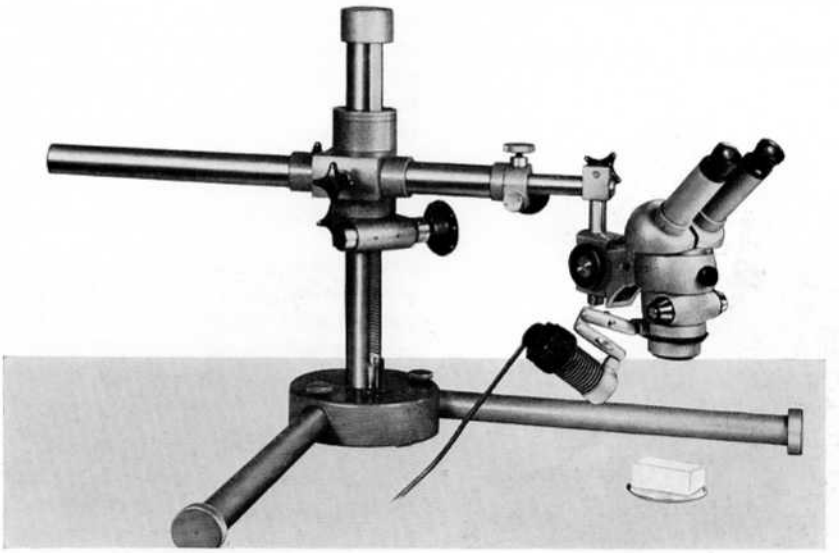
Distance of optical axis from base (18 cm diameter): approx. 75 cm.
Swivelling range: 90°.

After the clamping screw in the base of the stand has been loosened, the legs can be turned so that the eccentric discs at their ends ensure perfect stability of the stand.



18

For observing vertical surfaces, the stereo tube is set up in this manner.



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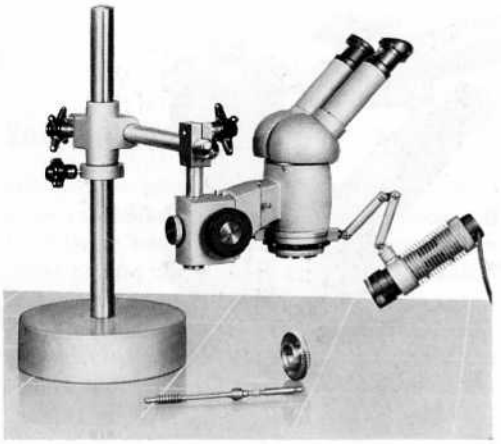
Large table stand H

Distance of optical axis from base (18 cm diameter): 70 cm plus 8 cm pinion movement.
Swivelling range: 90°.

Legs have eccentric discs at their ends (see table stand J). The swivel arm is vertically adjustable within 22 cm by a rack and pinion. A spring incorporated in the column guarantees easy and smooth height adjustment by means of a nylon tape. A rack and pinion on the swivel arm extends the setting range of the latter by 8 cm.



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Small table stand C

Distance of optical axis from base (18 cm diameter): approx. 30 cm.
Swivelling range: 360°.

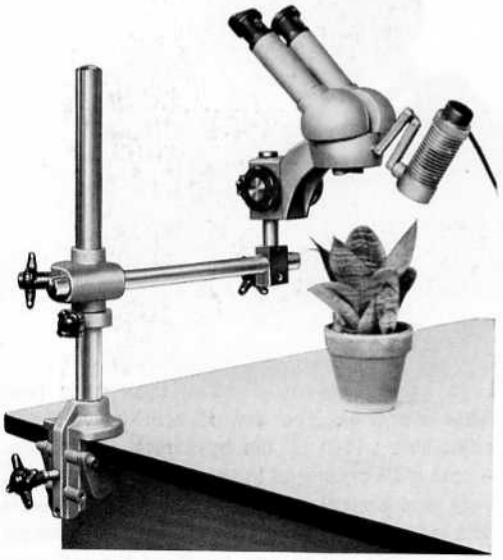

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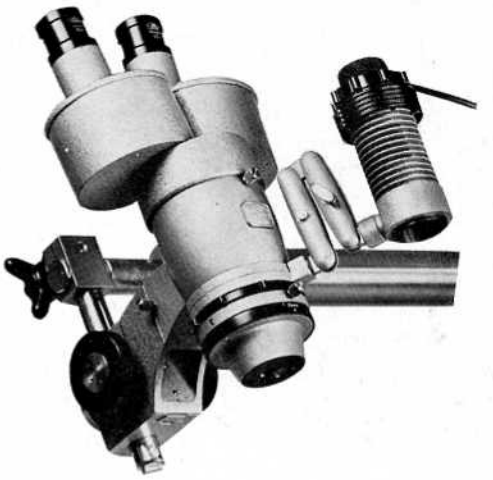
Table stand D with clamp

Distance of optical axis from column: approx. 40 cm.
Swivelling range: 360°.

The clamp has two positions for table tops to 2.5 cm thickness and to about 8 cm thickness.

Straight binocular tube

For certain types of work a straight rather than an inclined tube is required. The straight binocular tube is available for Stereomicroscope I, and can easily be exchanged for the inclined tube. If the straight tube is desired on Stereomicroscope III it must be ordered with the microscope, as a later exchange is not possible for reasons of adjustment.



22 Straight binocular tube on Stereomicroscope I

Auxiliary device for stereoscopic depth measurements

This device is available with stand with rack and pinion, provided with holes which accept the dial gage, a clamping piece with stop for the dial gage, two 10× eyepieces with focusing eyelens and built-in triangular indices, together with two eyepiece clamp rings. Any commercially available dial gage with readings to $^1/_{100}$ mm may be clamped to the rack and pinion.

First adjust each eyepiece to your visual acuity by pointing it at a bright surface and screwing the eyelens in until the triangular index appears in sharp focus. The eyepieces are then clamped into position in their respective tubes with the indices in perfect coincidence in the field of view.

For measuring purposes, the binocular tube is lowered so that first a higher object point is sharply defined beside the index, and then a lower point, or vice versa. The depth (difference) can then easily be determined with the aid of the dial gage. Due to the shallow depth of field, measurements should always be made with an initial magnification of 4×.

The accuracy of the dial gages is limited as it is and is furthermore affected by mechanical slackness, contamination at the stop point, etc. For maximum possible accuracy it is, therefore, recommended to repeat measurements.

23 Depth measurement with Stereomicroscope III

The illustrations are not binding in every detail for the design of the instruments.

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