Microscope Camera MC 100

Operating Instructions

G 42 - 401 - e

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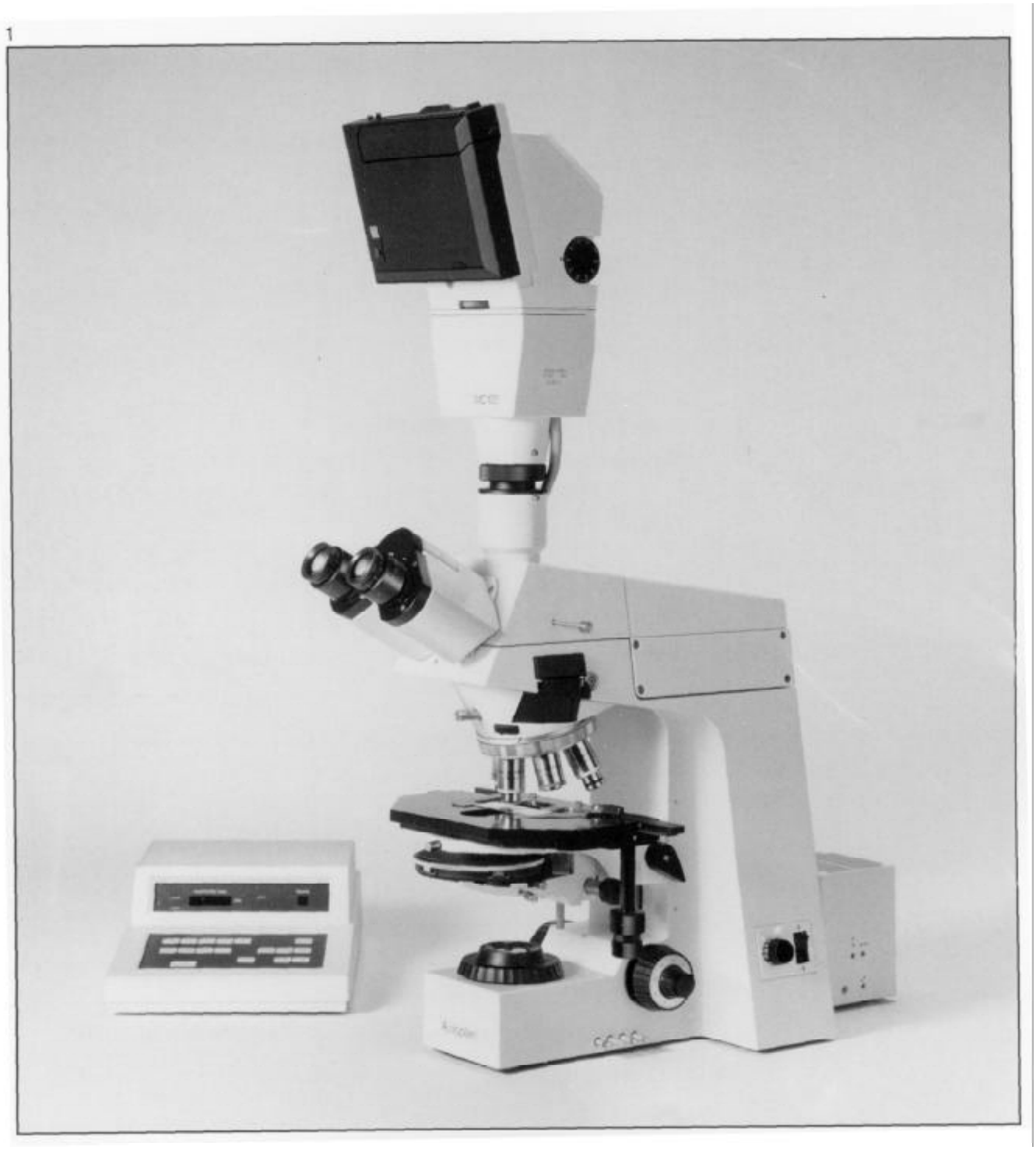


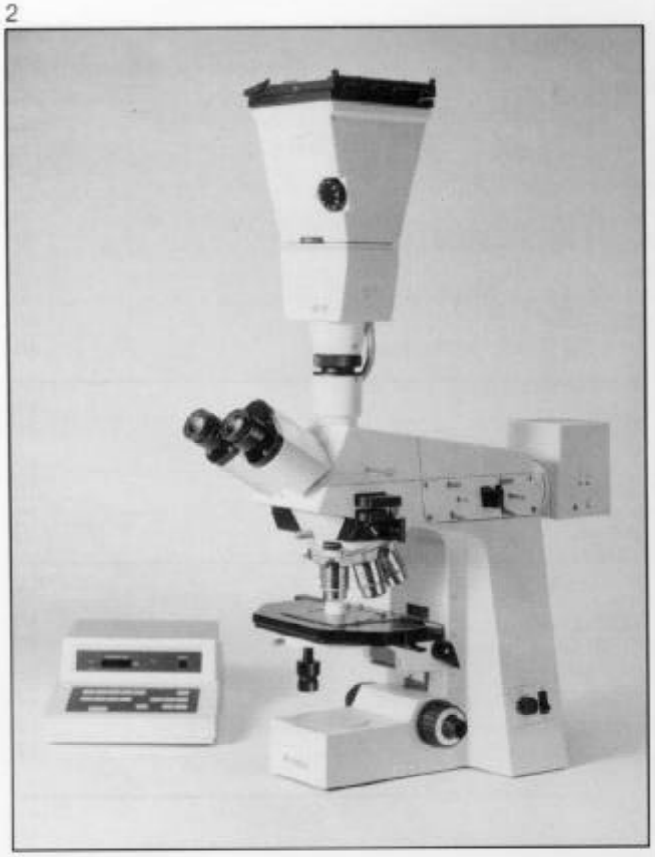
Universal transmitted-light microscope Axioplan
with camera attachment CB 33 for Polaroid auto film

Contents

Special notes:

- The 6- to 10-digit numbers, e.g. 451480 are ordering numbers of instruments or instrument components.
- Caution!
  The instruments shall not be used in environments with explosion risks.
- The instruments shall be changed and/or repaired only by the manufacturer or his authorized representative(s).
- Specifications subject to change.

2



Universal reflected-light microscope Axioplan
with 4×5″ camera attachment

3

Transmitted-light more-than-routine
microscope Axioskop
with 35 mm film cassette Mot

Important technical data

- Fitting on the 40 mm dia. phototubes of all microscopes.
- Choice of large-format camera:
  4×5″ camera attachment with international back,
  camera attachment CB 33 for Polaroid auto film
  or 35 mm camera:
  35 mm film cassette Mot
- Automatic film advance: 35 mm camera and camera attachment CB 33;
  Automatic advance to the first picture of newly loaded film and motorized rewinding: 35 mm camera.
- Automatic exposure control for all 3 cameras
- Decimal display of exposure time, downcounting during exposure
- Exposure time automatically extended when changing between 35 mm and large formats
- 9 reciprocity code numbers for automatic correction of reciprocity failure
- Shortest exposure time 0.01 s;
  longest exposure time (lower limit of exposure measurement) with 100 ASA
  for 35 mm film: 4 min.
  for large format: 1 hour
- The automatically determined exposure time can be stored for reference exposures
- Multiple exposures
- Exposure adjustment within a range of 2 shorter or 2 longer exposure values
- Automatic exposure series with pre-selected exposure adjustment (calibration series etc.)
- Integral exposure measurement with emphasis on central area, covering ca. 50% of the photographic format.
- Data projection with data back (accessory)
- Flash mode

The 35 mm film cassette Mot allows the use of commercially available 35 mm film cartridges (the identification of the cartridge remains visible from the outside).
The camera attachment 4×5″ with international back accepts sheet film, Polaroid sheet-film and film-pack cassettes (545 and 550), and 6×6–6×12 cm roll film cassettes.
The camera attachment CB 33 allows the use of Polaroid auto film.

The image scale on the film is the product of the magnifications of objective and photo eyepiece and of the camera factor; this is 0.25 for 35 mm film and 1.0 for large format.

For Stereomicroscopes SR and SV 8 with the most commonly used objective of the focal length f = 100, the image scale is the product of adjusted magnification factor, photo eyepiece magnification and camera factor.

For objectives with other focal lengths the factor $\frac{100}{f_{\text{objective}}}$ must also be considered:

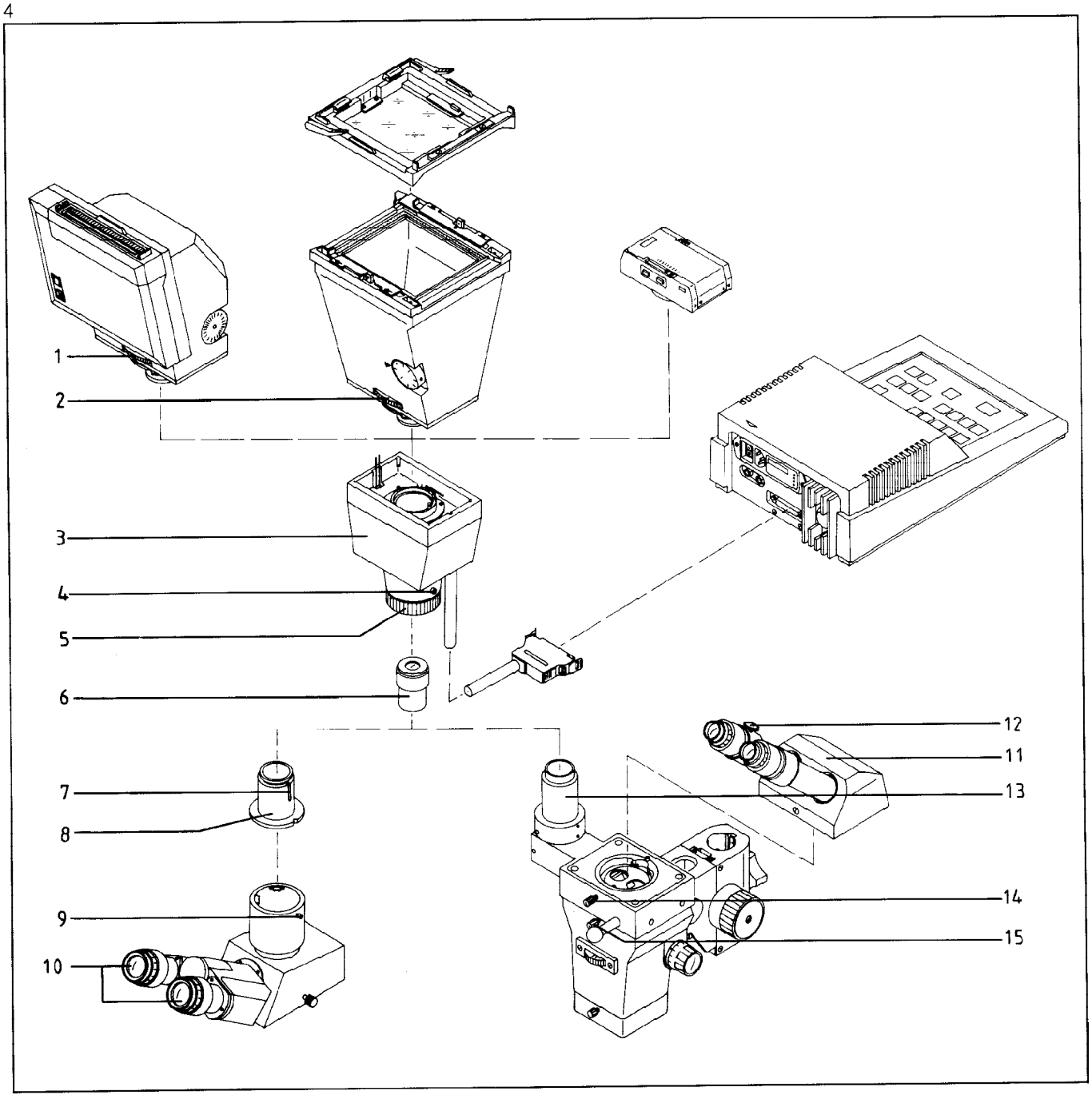
Example: 35 mm camera on stereomicroscope set at 2.5, photo eyepiece 10×, objective f = 150:

$$2.5 \times 10 \times 0.25 \times \frac{100}{150} = 4.2$$

4.2 : 1 is the image scale on the film.

With the 4×5″ camera attachment (camera factor 1×) the metallographic standard magnifications are achieved with a 10× photo eyepiece and reflected-light objectives 5×, 10×, 20×, 50×, 100×.

4



Assembly

Mounting on microscopes Axioplan, Axiotron and Axioskop

- The two focusing eyepieces (10) are plugged into the binocular part of the phototube; one is equipped with the photographic reticle for the camera.
- A plate is screwed to the base of the Axioskop to stabilize the microscope.
  The Axioplan base is provided with a plastic plate.
- The fixture for the microscope camera (8) is connected with the phototube by socket head cap screw SW 3 (9) which engages the notch in the fixture.
- Photo eyepiece (6), usually an S-PL 10X, is plugged into fixture (8). A photo eyepiece S-PL 12.5X is also available.
- Slide the basic body MC 100 (3) with the socket head cap screw SW 3 (4) in notch (7) on the fixture (8) as far as it will go, and secure it by turning clamping ring (5) anticlockwise.
- Mount the selected camera attachment on the basic body MC 100 so that the contact pins firmly engage the sockets. Before mounting the camera attachments 4×5″ and CB 33, turn knurled ring (1, 2) – red index line to index dot. Then mount the camera attachment and secure it by turning the knurled ring anticlockwise.

Mounting on Stereomicroscopes SR und SV 8

The assembly is similar to the Axioplan and Axioskop microscopes, with these exceptions:

- The phototube S (13) is fixed on the stereo body with clamping screw (15) and equipped with photo eyepiece (6), usually an S-PL 10X.
- The binocular tube (11) is mounted on the phototube and secured with clamping screw (14).
  The clamping ring (12) secures the orientation of the photographic reticle in the eyepiece which faces the microscope camera.
- With loosened screw (4) the basic body MC 100 pointing forward is mounted on the phototube S as far as it will go, and secured by turning clamping ring (5) anticlockwise.

Mounting on Standard microscopes

The assembly is similar to the Axioplan and Axioskop microscopes, with these exceptions:

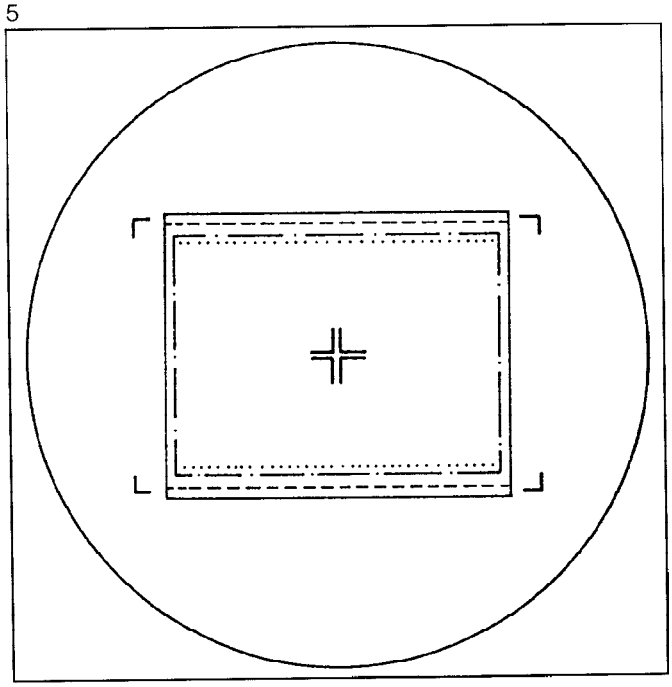
- The camera tube of the phototube is equipped with a photo eyepiece of the Standard microscope program, e.g. an S-Kpl 10X.
- The basic body MC 100 is mounted on the phototube like the phototube S of the stereomicroscopes.

The photographic reticle

The image section covered by the 35 mm film cassette Mot is outlined on the photographic reticle. The adjustment can be controlled with the double crosslines in the center. For exposure these crosslines and the object image must be in focus. A focusing eyepiece which is supplied with the equipment is equipped in the factory with an oriented photographic reticle. This eyepiece with reticle is inserted in one of the binocular tubes, and the camera aligned parallel with the photographic reticle.
The eyepiece with reticle is inserted in the binocular tubes of the Axioplan, Axioskop and Standard microscopes so that its guide pin engages the notch in the tube, in the stereomicroscopes it is aligned by turning and secured with the clamping ring.
Fig. 5 shows the reticle (double crosslines and outlined image section on 35 mm film).
The image sections covered by the different camera attachments or cassettes are also shown.

For a list of the available photographic reticles see page 19.

5



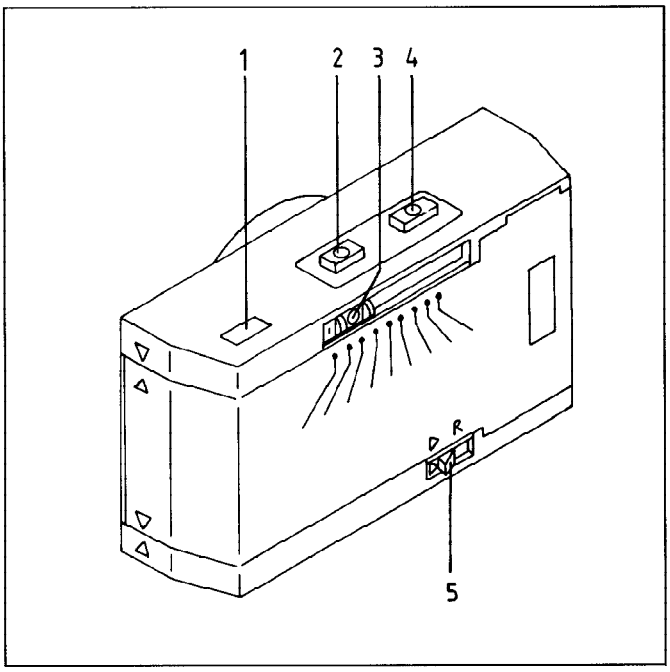
⌜ ⌝ ⌞ ⌟ 35 mm film cassette Mot

Not marked on the reticle:

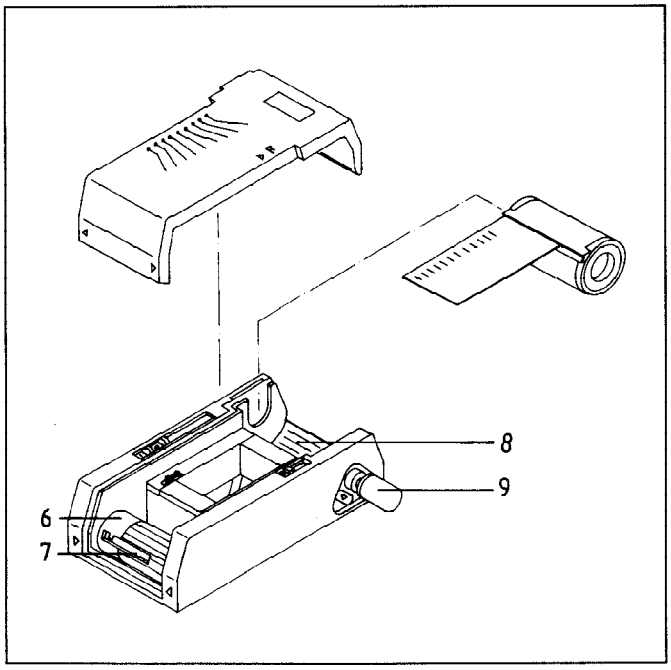
- · — · – sheet film 9×12 cm in camera attachment 4×5″
- ——— sheet film 4×5″ in camera attachment 4×5″
- – – – – Polaroid 545 and 550 in camera attachment 4×5″
- · · · · · · Polaroid 3×4″ in camera attachment CB 33.

Worthwhile facts about the camera attachments

6



7



35 mm film cassette Mot

Taking the cassette off: depress „eject" key (4) and pull the cassette off. Setting the film speed: depress (2); (3) can be shifted. The adjusted ASA value is automatically transferred to the exposure control.

Loading the film: push lock (9) (bottom) in the direction of the arrow; the cartridge is ejected and the back can be taken off. Load cartridge in (8), depress (9), insert leader in slot (7), the sprocket teeth must catch the perforation; tighten the film by turning the take-up spool (6) outward (this can be done only if the rewind slider (5) is set to „R"); insert left side of camera back (arrows) and press on the right side. The mechanical counter (1) is set to S (Start).

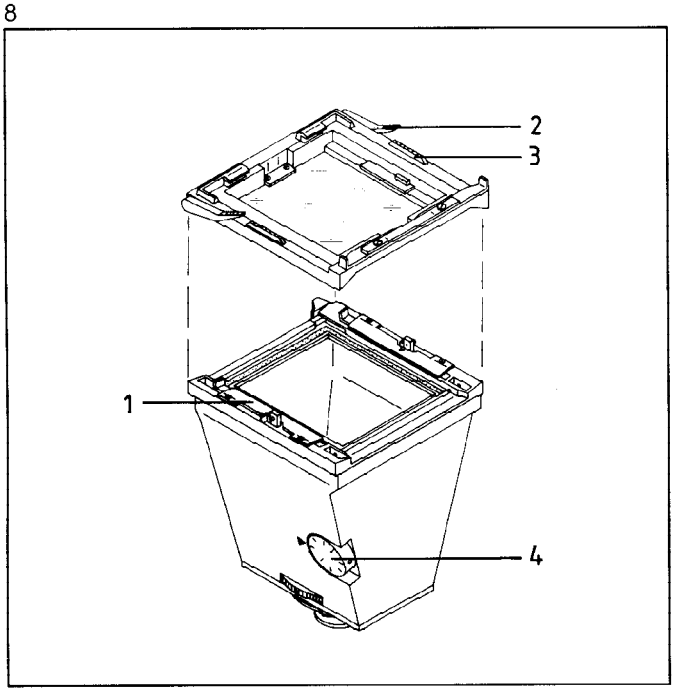
Attaching the cassette: press the cassette on the port of the basic body MC 100. If the control panel is switched on, the film advances automatically to the first picture and the counter is set to 0.
During and 3 s after the automatic advance to the first picture the ASA number is shown on the digital exposure time display of the exposure control. The instrument then changes to the previously set operating mode.
After exposure (and, with data back, data projection) the film is advanced and the frame number displayed by the mechanical counter (1) of the cassette.
When the end of the film is reached the film advance switches off and the display END of the exposure control flashes.

Rewinding the film: operating slider „R" (5) automatically rewinds the film; the display END flashes.
Automatic reset when attaching the camera back. After unloading the film the slider „R" is automatically set to normal film advance position when the camera back is attached.

Data back for 35 mm film cassette Mot

It is mounted like a normal camera back and year/month/day/hour/minute are set (for details see operating instructions of the data back).

8

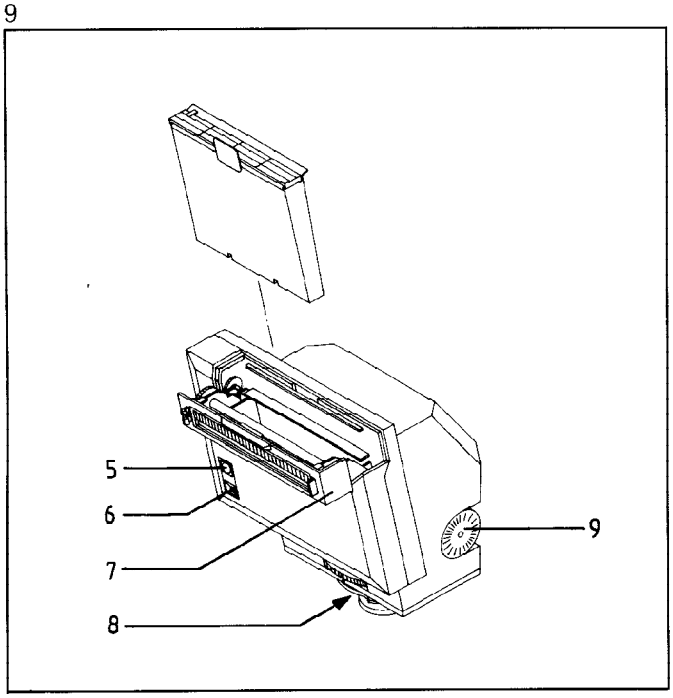


4×5″ camera attachment

The film speed is adjusted on (4), and this ASA value is automatically transferred to the exposure control. When the 4×5″ attachment is attached to the basic body MC 100, the exposure control automatically switches over to large format. The camera optics can be unscrewed for cleaning.

Large-format groundglass and cassette holder: cassettes for the international camera back are slid behind the large-format groundglass which is lifted off before with (2). By depressing (3) the groundglass can be pulled out to the right; it is attached accordingly. Most cassettes need not be held by the groundglass, but are secured by lock (1). Accessories from the Sinar system (groundglasses, reflecting magnifier) fit in the groundglass frame.
It is recommended to stabilize the microscope Axioskop with a base plate if the 4×5″ camera attachment is mounted on this microscope. This base plate is screwed to the microscope base.

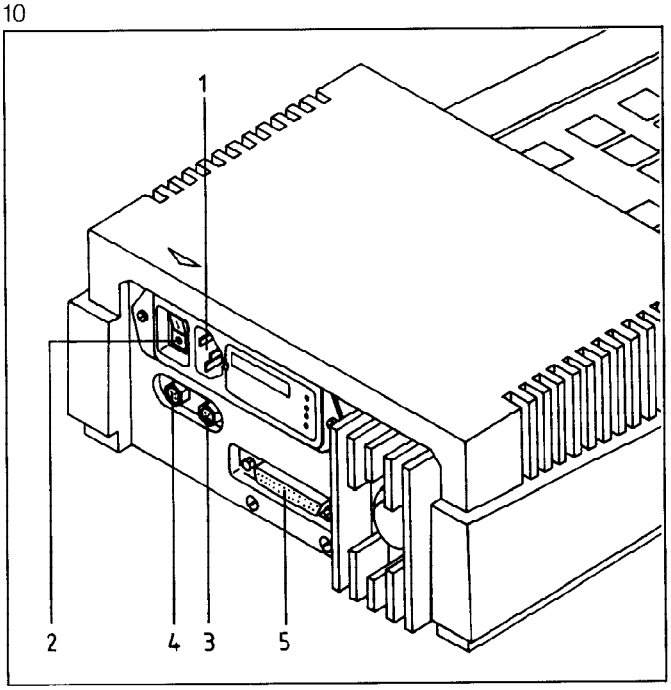
9



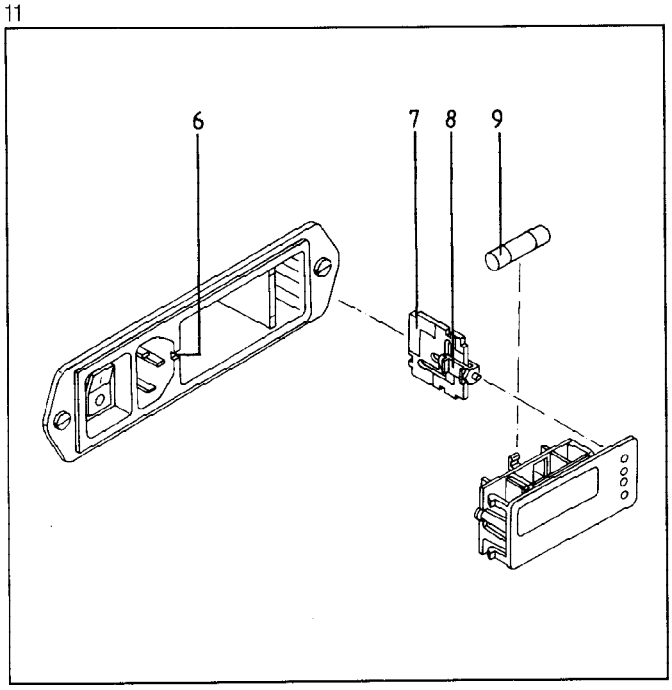
Camera attachment CB 33 for Polaroid auto film

The film speed is set on (9). Here too, the ASA value is automatically transferred from the camera attachment to the exposure control which automatically switches over to large format when the attachment is mounted on the basic body MC 100.
Loading a film pack: pull lid (7) forward and slide in film pack from above so that its closed cover is in front and the eject opening on top.
If the lamp in window (8) lights, the wrapper is still in front of the film. Depress the green key (5); the wrapper is ejected and the light goes out. The number of frames (from 1–10) is shown in (6). Each picture is ejected after exposure, and the next one automatically made ready for exposure.
The camera optics can be unscrewed for cleaning.
Caution: when the camera attachment CB 33 is removed from the basic body the ready picture is exposed!

10



11



Sockets

1. Power input.
Power consumption 20 VA. Connect instrument to the line with (1); it is provided for connection to 100 V, 120 V, 220 V, 240 V.
The adjusted voltage – white dot set to either of 4 voltages – must comply with the local line voltage.
Should a change be necessary, proceed as follows:

- Disconnect power cable from socket (1).
- With a small screwdriver or similar tool in the recess betweeen jack and fuse plate, lift out the plate.
- You can now pull out of the small compartment to the right a square plate (7); the adjusted voltage is indicated on this plate opposite (8). The other voltages are imprinted on the remaining three sides.
- Shift (8) until it engages the recess opposite the voltage you want to set.
- Slide the plate back into the compartment – legend to the left. When the fuse plate is put on again, the white index pin will indicate the correct voltage.

NB: When the voltage is changed, check whether the right fuse (9) is inserted:
for 100...120 V: 0.63 A SB, Cat. No. 380127-0180
for 220...240 V: 0.315 A SB, Cat. No. 380127-0150

2. Power switch (see „Keys and displays", p. 12)

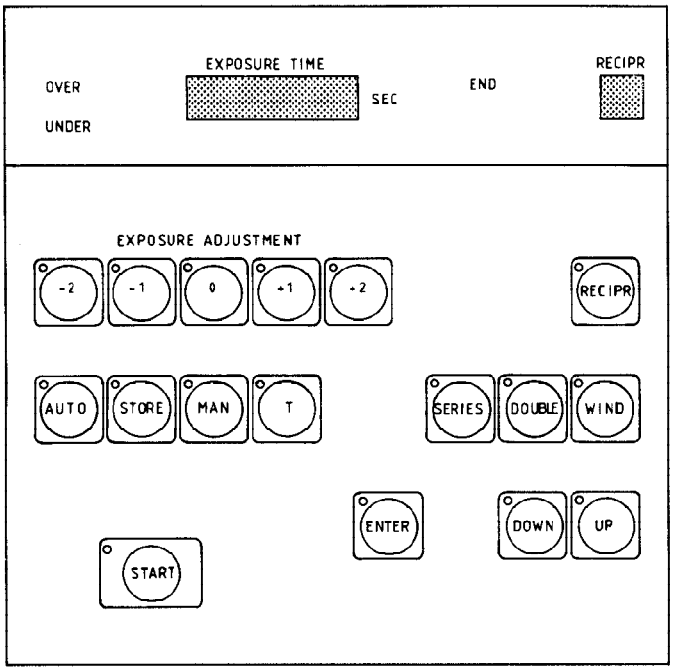
3. 4-prong socket for flash synchronization via control cable

4. 2-prong socket for remote release

5. Socket for cable of microscope camera MC 100. Plug multipoint connector into socket and screw it together.
Caution: connect or pull plugs only when the instruments are switched off.

Keys and displays

12

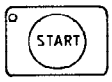


For better identification the legends of the displays are capitalized below (e.g. OVER), those of the keys capitalized and framed (e.g. START).
If a display or key lights, a function is activated or a specific state of a function displayed. A flashing key or display reminds of something, e.g. to make an input, to end it, etc.

Most important:
Basic setting and exposure

All keys and displays and their applications will be described below. To start with, the most important operating controls:
Power switch on exposure control on: basic setting
Key START : exposure

The exposure control is electrically connected with camera and line; it is operative when the power is on.
The following basic setting is displayed:
AUTO lights: the automatic exposure control is operative.
EXPOSURE TIME displays the adjusted exposure time.
EXPOSURE ADJUSTMENT and 0 light: the exposure is automatically adjusted to 0.
RECIPR 3: the reciprocity code number is suitable for most practical applications. When RECIPR is depressed, this value can be changed with UP or DOWN or keyed in with ENTER .

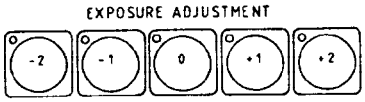


START : release key for exposure of the film. With 35 mm camera this is followed by data projection and film advance, with camera attachment CB 33 by motorized film advance.
Time display EXPOSURE TIME: downcounting to 0.

The release is blocked if:
no cassette is attached or no film loaded;
the end of the film attained;
the film advanced or rewound;
an input started;
OVER lights.
If an adjustment is not terminated, one of the keys will flash (exception: release is possible if DOUBLE flashes).

Depress T and release with START: the shutter opens; it is closed when START is depressed again. With this kind of exposure, EXPOSURE TIME counts up.

Further keys and displays



[-2] [-1] [0] [+1] [+2] EXPOSURE ADJUSTMENT:
exposure control in whole steps. Normal position for medium object contrast is [0] . With power on, the instrument is therefore automatically set to [0] .

[+1] exposure time extended by 1 exposure value, that is by a factor of 2;

[+2] = factor 4,

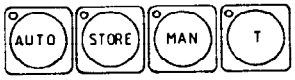
[-1] = factor 0.5

[-2] = factor 0.25

[+1] means, for example, that the exposure time will be one value longer than recommended by the automatic exposure control (the exposure time is doubled, negatives will be darker, positives and Polaroid images brighter).

Applications:
1. An automatic exposure control converts the brightness of an object into mean brightness of the image, because the instrument cannot identify an object as exceptionally bright or dark. The exposure control prevents, for example, a bright object from becoming „gray" in the slide because of underexposure. An exceptionally bright object will be bright also in the image if the exposure time is doubled, i.e., the exposure adjustment set to [+1]. For dark objects corresponding minus values must be set.
General rule:
For brightfield adjust the exposure time with [0] to [+2] , for darkfield and fluorescence with [-1] bis [-2] .

2. If you are not certain whether a specific critical object feature is better represented by projection or by a picture, it is recommended to use longer or shorter exposure times besides the determined one, and [SERIES] for automatic exposure series.



[AUTO] : automatic exposure measurement and display of the determined exposure time. It is automatically provided with power on, because it is generally the best choice. Measurement and display only with attached camera. If no film is loaded in the 35 mm cassette, END will light.

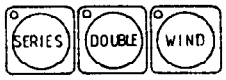
[STORE] : the exposure time measured with [AUTO] is stored. It remains stored also when working intermittently with [T] oder [MAN] .

Applications:
1. Exposure series of extended specimen areas. If the exposure time were not stored, the exposure and also the brightness of the background would be different depending on the surface coverage.
2. To represent different intensities with multiple exposures [DOUBLE] .

[MAN] : fixed exposure times are keyed in manually and the chosen exposure time is displayed. With power on 1 s is displayed; the exposure time can be changed in steps with [UP] and [DOWN] and keyed in with [ENTER] .

[T] TIME (long-time release):
Depressing [T] followed by release with [START] opens the shutter which is closed again when [START] is depressed again.
If the 35 mm film cassette Mot is attached the shutter can be opened with [T] even if the back is taken off.

RECIPR : compensation of reciprocity failure. The sensitivity of all photographic emulsions decreases when the illumination intensity drops to values which require exposure times of 1 s or more (reciprocity failure). Without compensation long exposure times will result in underexposures. The exposure control compensates the failure automatically. The automatic compensation is made in 9 steps for adjustment to the varying decrease in sensitivity of photographic emulsions.
For the reciprocity code number which applies to your specific film see page 16.
The step displayed by RECIPR can be changed with UP or DOWN and keyed in with ENTER .



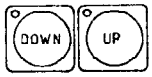
SERIES : for 35 mm exposure series with specific time periods. Depress SERIES , select the specific time periods in the desired sequence with EXPOSURE ADJUSTMENT and key them in with ENTER . Depress START ; the exposure series is made automatically.
End of film, exchange of film cassette or WIND will terminate the exposure series which must then be keyed in again.

DOUBLE : for double exposures. Depress DOUBLE before releasing with START to prevent automatic film advance after exposure.

Applications:

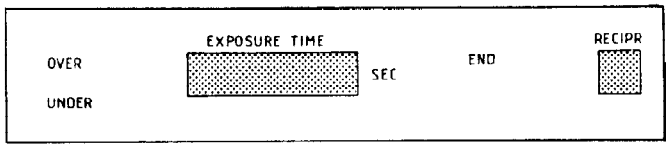
1. Multiple exposures of the same specimen field using different illumination methods, fluorescence filters, etc.
2. Multiple exposures to imprint scale bars, marks, grids, etc.
Caution: because the exposures overlap at least in part, shorten the single exposures, e.g. with - 1 .

WIND : for blank exposures or to interrupt an exposure. In the 35 mm camera the film will be advanced, in the camera attachment CB 33 the frame.



UP and DOWN : the keys light if an input is started with MAN or RECIPR. UP increases each value by one step; the increase will be continuous if the key is held down, and DOWN reduces the value accordingly.

ENTER : input key after MAN, RECIPR or SERIES.
If no input has been started, the ASA number is displayed for ca. 3 s with ENTER and EXPOSURE TIME.



OVER: it lights if the determined exposure time is shorter than 0.01 s; the zeroes of EXPOSURE TIME also light. Exposure cannot be released with START , unless a neutral density filter is swung in.

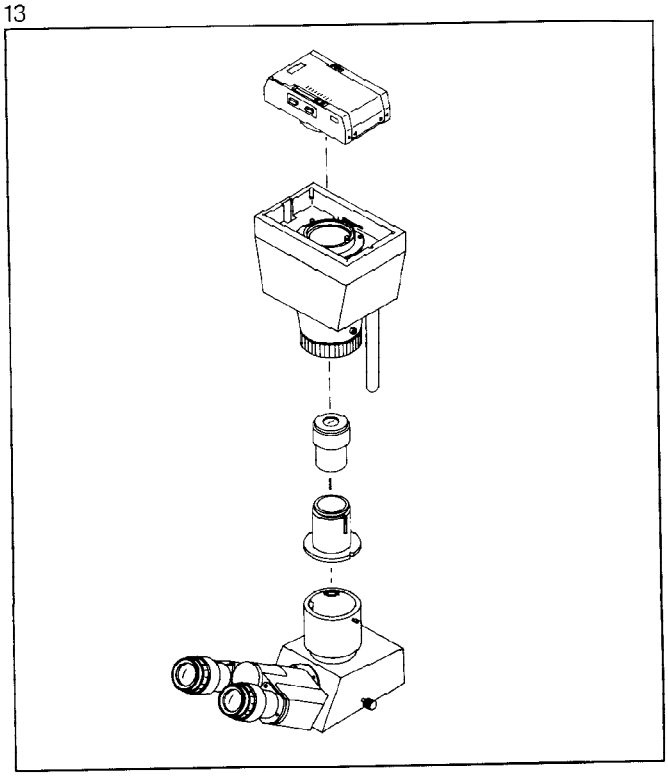
UNDER: it lights with values below the lower limit of the measuring range or a determined exposure time above 9999 s. EXPOSURE TIME displays the approximately determined long exposure time or 9999.

EXPOSURE TIME: it displays by four digits the seconds from 0.01 to 9.99 with decimal point, and in whole numbers as from 10 s.

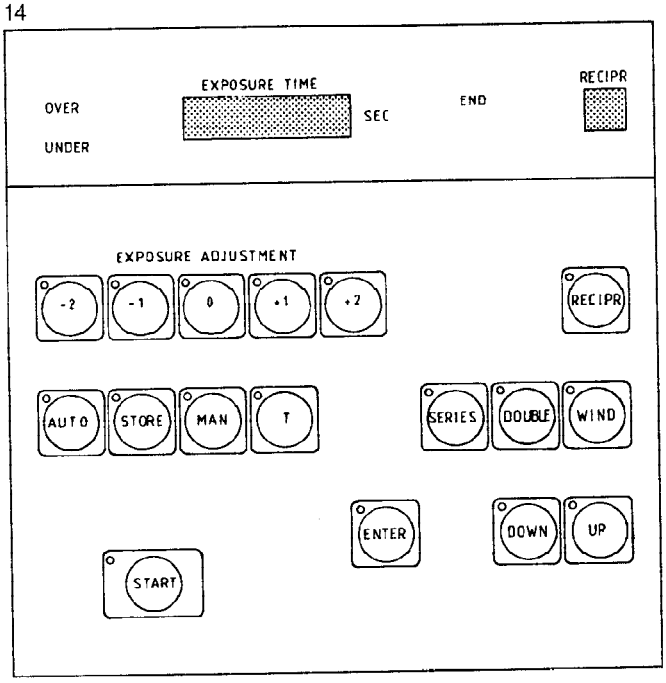
END: it flashes if the film end is reached or during rewinding, and lights if no film is loaded in the cassette or no cassette attached.

RECIPR: either of 9 programmed reciprocity code numbers is displayed which was keyed in with RECIPR, DOWN/UP and ENTER .

13



14



B/W photomicrography

The microscope is ready for observation; crosslines and object are in focus. At low magnifications use an auxiliary telescope for the adjustment. Set the pushrod of the phototube to photography. Load a film in the cassette (for the right film choice see page 16) and attach the cassette. Set the film speed on the cassette.

The exposure control is electrically connected with camera and line. Switch on the exposure control.

- OVER lights: reduce the brightness with neutral density filter
- UNDER lights: is the light path free?
- The determined exposure time is displayed
- RECIPR displays 3. If the loaded film requires another reciprocity code number (see Table on page 16), key this value in with RECIPR , DOWN/UP and ENTER .

Release with START .
A green filter will enhance the contrast (see page 19).

Color photomicrography

In addition to the above, observe the following for color photomicrography:

Color reversal film is available for daylight (5500 K) and artificial light (3200 K). High color fidelity is ensured if the color temperature values are correct to within ca. 100 K.
For photomicrography we recommend artificial-light reversal films (3200 K). For daylight film use a conversion filter which increases the color temperature from 3200 K to 5500 K. (Flashlight has daylight color temperature).
Note that the color temperatures of film and light source must coincide or be matched by filters and/or voltage adjustment.
Set the voltage for the light source to the value required for 3200 K.
For 3200 K the 12V 50W Hal illuminator of the microscope Axioskop must be set to 12V, the 12V 100W Hal illuminator of the microscope Axioplan to ca. 11V. Too high brightness can be attenuated by one or several neutral density filters which have no influence on the color temperature.

For more information see A 41-400.5.

Compensation of reciprocity failure

Exposure times above 1 s call for compensation of the reciprocity failure (see also description of key RECIPR on page 14). The reciprocity code numbers of some frequently used films are listed in the opposite table.

For film types which are not listed you can determine the value yourself.
The film manufacturers indicate correction values for long exposure times, e.g. 10 s + 8 s, i.e., 18 s adjusted exposure time. Adjust the microscope so that the automatic exposure control indicates 10 s with RECIPR set to 0 (here, you may exceptionally use the aperture diaphragm to reduce the brightness).
Change these values to find out the one which best approximates the required 18 s; this is the reciprocity code number for the film, 4 in the above example.

For color photomicrography remember the correction by filters, which is generally recommended by the film manufacturers.

If the film manufacturer does not give corresponding information, you must make a number of test exposures with different reciprocity code numbers to find out the right one.

Reciprocity code numbers for some frequently used film types:

Film	Code number
AGFACHROME RS 50, 100, 200	5
AGFACHROME RS 1000	4
FUJICHROME 50 D, 100 D	3
EKTACHROME 50, artificial light	4
EKTACHROME 64, 400	6
EKTACHROME 160, artificial light	5
EKTACHROME sheet film 6118, artif. light	1
POLACHROME CS	9
POLAROID 58, 668	7
POLAROID 339	6
AGFAPAN 25	6
AGFAPAN 100, 200, 400	8
AGFA ORTHO 25	1
ILFORD PAN F	4
ILFORD HP 5	6
KODAK PLUS-X, TRI-X	9
KODAK Technical Pan 2415	3
POLAROID 51	3
POLAROID 52, 552, 55	1

Photomicrography in polarized light

In differential interference contrast (DIC) or polarization (POL), correct exposure measurement can be guaranteed only with a quartz depolarizer (randomizer) in the microscope:
The following procedure is a makeshift solution:

- Microscope camera ready, determined exposure time e.g. 1.00 s
- Loosen socket head cap screw which secures the camera position and turn the camera through ca. 90°. The indicated exposure time, e.g. 0.32 s corresponds to the rated value.
- Turn camera back to working position and secure it. Adjust rated value with exposure adjustment. As long as the analyzer is in the beam path this adjusted value is correct at all objective magnifications.

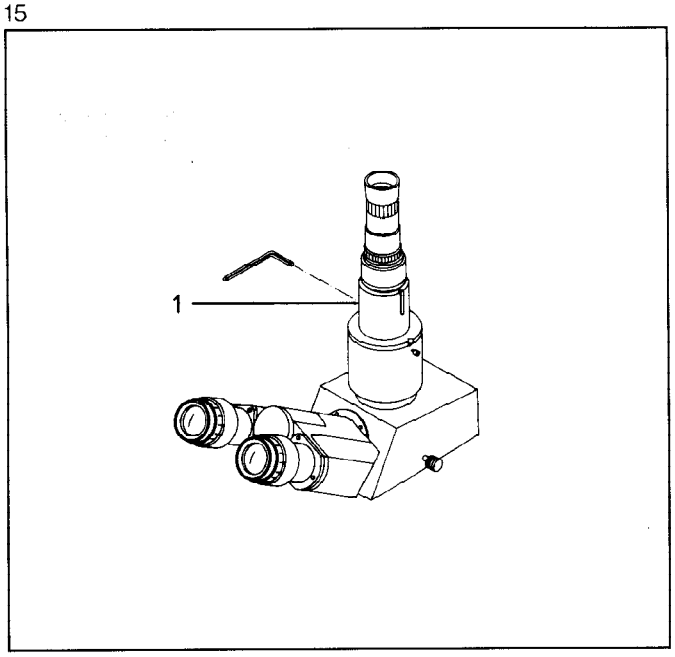
Photomicrography in fluorescence, darkfield and polarized light

Overexposures due to dark background (negative too dark, bright slide, Polaroid picture too bright) can be corrected with [- 2] EXPOSURE ADJUSTMENT. If [- 2] is insufficient, the range of correct exposure can be further extended by [MAN] [UP/DOWN] [ENTER] .
If the brightness is exceptionally low, straylight may reach the film through the microscope eyepieces and is imaged.
No light source should then stand behind the user and the room illumination should be dimmed.

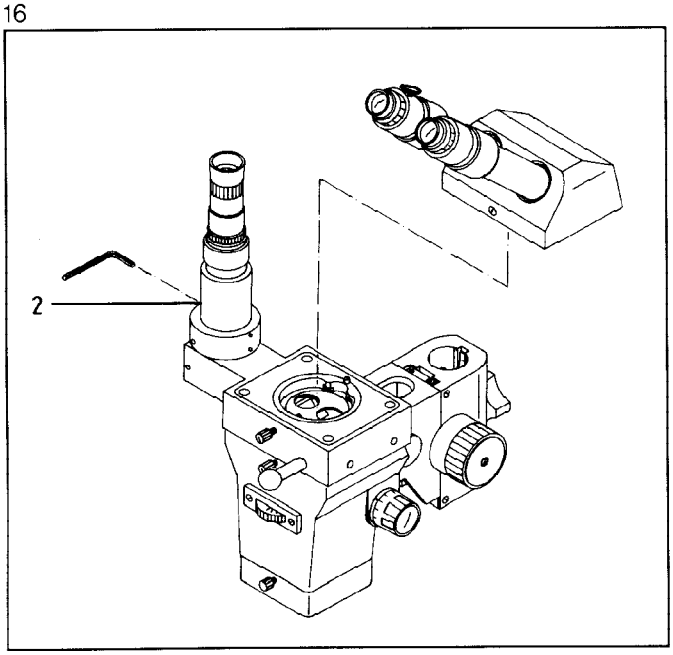
Microflash

With [MAN] and [DOWN] of the exposure control set the synchronization time of 0.01 s on the digital time display and key it in with [ENTER] . The flash can then be released with [START] .

15



16



This procedure is necessary only if a microscope is retrofitted with a microscope camera or if the correct parfocalization of a microscope is doubtful.
For adjustment through the viewing tube the object must also be in focus in the phototube.
Re-focusing is easy with the adjustable phototube.

- Photo eyepiece in the adapter for microscope camera, eyepiece with reticle in the binocular tube.
- Set telescope 3×12 to infinity.
- With the telescope on the focusing eyepiece with reticle focus on the crosslines by turning the eyepiece.
- Focus the microscope with a high-contrast specimen and an objective of low magnification (e.g. 10×).
- With the telescope on the photo eyepiece check and optimize the focus of the specimen image.
- If the image in the photo eyepiece is not in focus, the adapter for the microscope camera must be readjusted:
  With screwdriver SW 1 loosen clamping screw (1) of phototube for new microscopes Axioplan and Axioskop, and with screwdriver SW 3 clamping scew (2) of Standard and Stereomicroscopes.
- Turn phototube until the specimen image is in focus.
- Secure tube by tightening screw.
- Mount microscope camera on the phototube.

Photographic reticles

Microscope	Viewing eyepiece	Photographic reticle for 10X photo eyepiece	Photographic reticle for 12.5X photo eyepiece
Axioplan	PL 10X/25	MC 10X 26 dia. 45 40 75	MC 12.5X 26 dia. 45 40 76
Axiotron	PL 10X/25	MC 10X 26 dia. 45 40 75	MC 12.5X 26 dia. 45 40 76
Stemi SR/SV 8	W 10X/25	MC 10X 26 dia. 45 40 75	MC 12.5X 26 dia. 45 40 76
Axioskop	PL 10X/20	MC 10X 21 dia. 45 40 25	MC 12.5X 21 dia. 45 40 26
Standard	CPL 10X/18	MC 10X 19 dia. 47 60 21	MC 12.5X 19 dia. 47 60 16
Universal	Kpl 10X/18	MC 10X 19 dia. 47 60 21	MC 12.5X 19 dia. 47 60 16
IM	Kpl 10X/18	MC 10X 19 dia. 47 60 21	MC 12.5X 19 dia. 47 60 16

Filters for photomicrography	**32 mm dia.**	**18 mm dia.**
Neutral density filter 0.50 (50% transmission)	46 78 40	
Neutral density filter 0.12 (12% transmission)	46 78 41	
Neutral density filter 0.03 (3% transmission)	46 78 42	
Neutral density filter 0.25 (25% transmission)		46 78 56
Neutral density filter 0.06 (6% transmission)		46 78 55
Conversion filter 3200–5500 K	46 78 47	46 78 54
Blue filter CB 6	46 78 51	
Blue filter CB 3	46 78 52	
Green interference filter	46 78 03	

Film cassettes for 4×5″ camera attachment

Double sheet film cassette 9×12 cm	47 61 27
Double sheet film cassette 4×5″	41 61 31
Polaroid sheet film cassette 545	41 61 28
Polaroid film pack cassette 550	41 61 27