

Leica DM C

Operator manual · Bedienungsanleitung
Mode d'emploi

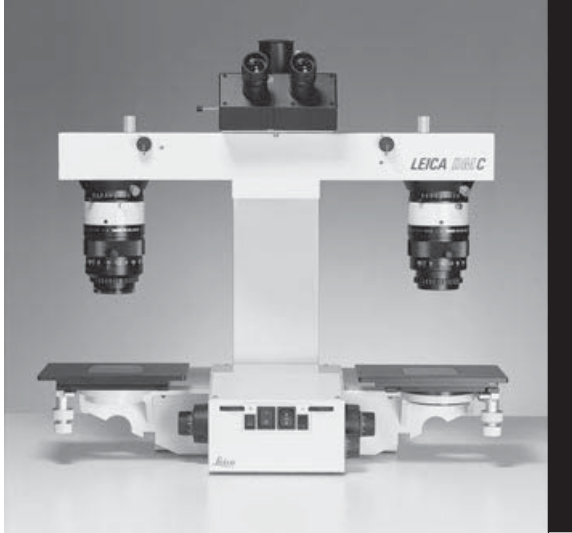
Leica

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Operator manual

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The information contained in the following documentation represents the latest stage of technology and knowledge. We have composed the texts and illustrations with great care. However, as it is impossible to eliminate the risk of error completely, we cannot accept any kind of liability for the correctness of the contents of this manual. Nevertheless, we are always grateful to be notified of any errors.

The information in this manual may be altered without prior notice.

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Important notes

This manual is an integral part of the Leica DMC Comparison Macroscope and must be read carefully before you start using the instrument.

This manual contains important instructions and information for operating the macroscope safely and keeping it in good condition. It should therefore be kept in a safe place.

The manual is multilingual and spiral-bound, so you can turn the language you need to the front.

We produce detailed brochures on microscopy. These and additional copies of this manual can be ordered from our agencies for a cover charge.

Text symbols and their meaning:

(1.2)

Numbers in brackets, e.g. (1.2) refer to illustrations, in this example Fig. 1, item 2.

→ p. 20

Numbers with an arrow, e.g. → p. 20 refer to a particular page in this manual.



Special safety information is indicated by the triangle symbol on the left and is given a grey background.



Caution! Operation errors can damage the microscope and/or its accessories



Warning of hot surface



Explanatory note



Not part of all configurations

General safety information

This instrument of safety class 1 has been built and tested according to EN 61010-1/IEC 1010-1 safety standards for electrical measurement, control and laboratory equipment.



Attention!

To keep the microscope in this safe condition, it is essential to note the advice and warnings given in this manual.



Attention!

The instruments and accessories described in this manual have been safety-tested and checked for possible hazards.

Before modifying the instrument in any way or combining it with non-Leica products not dealt with in this manual, it is essential to consult the Leica agency for your area or the main factory in Wetzlar!

Any unauthorized alteration to the microscope or use for which it was not intended will automatically terminate any warranty claim.

Electrical safety

General specifications

Leica DM C, order no. of stand: 581 000

For indoor use only.

Supply voltage (mains):

100 V/115 V/230 V $\pm 10\%$

Frequency: 50–60 Hz

Power consumption: max. 180 VA

Fuses:

230 V – 2 x T 0.8 A

115 V – 2 x T 1.6 A

100 V – 2 x T 2.0 A

6 V 20 W lamps:

Osram 64 250

Philips 73 88

Ambient temperature: 10–36 °C

Relative humidity: 0–80% at 30 °C

Overvoltage category: II

Contamination class: 2



Attention!

Using the ground connection, any accessories connected to the microscope which have their own and/or a different power supply can be given the same ground conductor potential. Please consult our servicing personnel if you intend to connect units without a ground conductor.

Make sure that only fuses of the specified type and rating are used as replacements. It is forbidden to use mended fuses or to short-circuit the fuse holder.



Attention!

The electric accessories of the microscope are not waterproof. If water gets inside them, it may cause electrical shock. Do not put the microscope and its accessories near a water tap or anywhere else where water may get inside them.



Attention!

Protect the microscope from major temperature fluctuations. These may lead to condensation which can damage the electric and optical components.



Attention!

Before changing fuses or lamps, always turn the mains switch off and disconnect the mains cable.

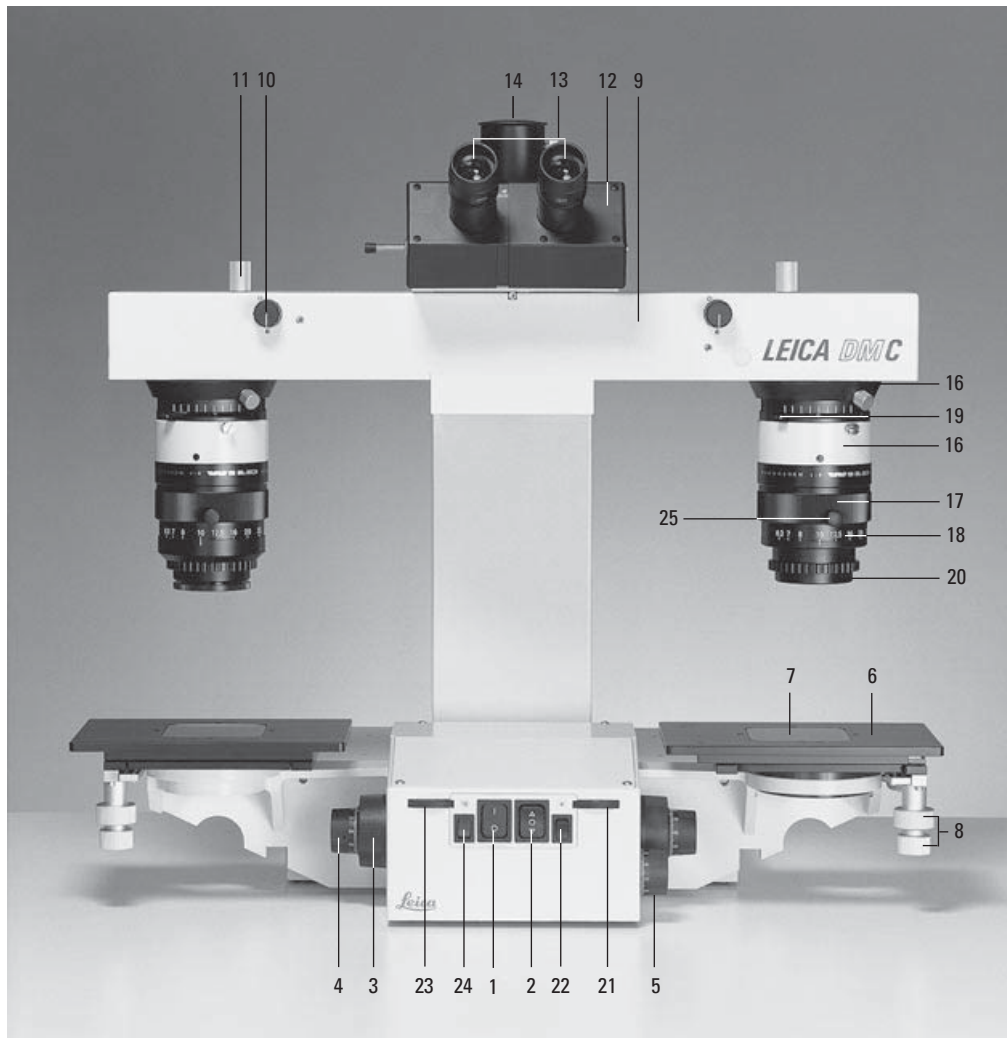


Attention!

Avoid skin contact when using immersion oil! Ask the supplier for a safety information sheet!

Fig. 1 Leica DMC Comparison Microscope

1 On/Off switch, **2** Toggle switch for motorized height adjustment, **3** Coarse focusing, **4** Fine focusing, **5** X drive for synchronized movement of the two mechanical stages, **6** Mechanical stage, **7** Glass insert, **8** Coaxial drive for adjustment of the mechanical stage, **9** Comparison device, **10** Knob for half diaphragm setting, **11** Knob for adjustment of half diaphragms, **12** Binocular photo-tube, **13** Eyepieces, **14** Photo adapter tube, **15** Illuminator mount with fixing screw, **16** Macrozoom objective, **17** Magnification adjustment, **18** Magnification scale with index, **19** Aperture diaphragm with scale, **20** Bayonet mount for supplementary lenses, **21** Intensity control (right), **22** Alternating switch (right), **23** Intensity control (left), **24** Alternating switch (left), **25** Magnification clickstop



Range of application

Comparisons of small areas or profiles can only be made with adequate accuracy if the objects being compared can be observed simultaneously.

Using a macroscope with only one imaging light path, the viewer needs a very good memory as his view is interrupted every time the objective is changed. The risk of wrong assessment can therefore never be completely eliminated for objects with only slightly different profiles or surfaces.

The Leica DMC Comparison Macroscope with two imaging light paths is used for structural comparisons in split or superimposed images as well as for documentation (photography or video recording) of

- firearm traces on fired ammunition parts
- toolmarks
- manufacturing traces on adhesive tape
- playback traces on magnetic tape
- documents
- print types
- bank notes
- stamps
- coins
- etc.

in forensic laboratories, document printing works, mints and banks. Illuminators are available both for incident light (including UV light) and transmitted light.

As the Macrozoom objectives and the comparison tube used on the Leica DMC comprise optical components (lenses, prisms and mirrors) that do not come from the same production lot with regard to their anti-reflection coating, there may be slight color deviations between the two part images for critical observations in split image mode.

Assembly and description of components

Unpacking and documents

Please compare the delivery carefully with the packing note, delivery note or invoice. We strongly recommend that you keep a copy of these documents with the manual, so that you have information on the time and scope of the delivery later when ordering more equipment or when the microscope is serviced. Make sure that no small parts are left in the packing material. Some of our packing material has symbols indicating environment-friendly recycling.

The microscope is delivered in a sturdy cardboard box with padding.

After opening the box and removing the top padding, pull the side supports out of the box and remove the boxes containing the accessories.

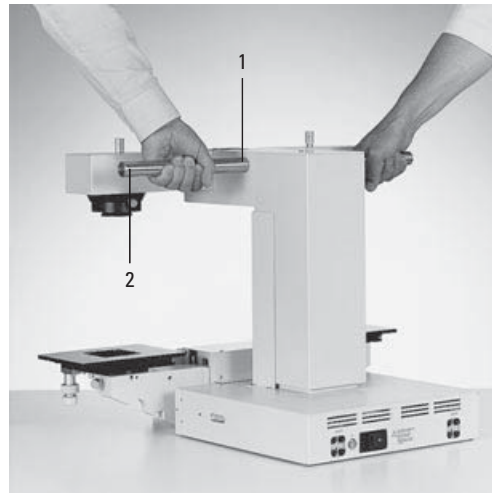
In the upper part of the microscope stand you will find two thread mounts on the left and right (2.1) for attaching the supplied carrying handles (2.2). Screw them into the thread mounts after removing the stoppers.

! Attention!

It is important to use the handles for lifting the microscope out of the box and moving it to its installation site.

The handles can be later be screwed off and the stoppers replaced in the threads.

Fig. 2 Carrying the Leica DMC Comparison Microscope
1 Thread mount for screwing in the carrying handles,
2 Handle





Attention!

Do not connect the comparison microscope and peripherals to the mains yet.

Installation site



Attention!

Make sure that the workplace environment is free from oil and chemical fumes. Vibrations, direct sunlight and major temperature fluctuations impair measurements and photomicrography. For ergonomic microscopy we recommend a stable desk (about 70–80 cm high) and a comfortable, adjustable chair.

Setting the mains voltage



Attention!

Make sure to check the voltage setting (230, 115 or 100 V) on the back of the microscope and correct if necessary (see Fig. 14, p. 21).

Remember to disconnect from the mains first!

Release the locking mechanism by pressing with a ballpoint pen or pencil and remove the fuse holder. Pull out the square module and plug it in so that the required mains voltage appears on the outside (upside down).

Replace the fuse holder until you hear the locking button click into position.

Fuses

The two mains fuses can be accessed by pressing the locking button.

Never use fuses of a different rating!



Attention!

For external lamp switching procedures, always set the mains voltage as per the separate instruction manual or use a transformer, e.g. 115/230 V.

Basic instrument

The basic instrument consists of

- the base
- the upper part with motorized height adjustment
- coaxial focus drives
- mechanical stages with glass inserts
- X drive for synchronized adjustment of the two stages
- control unit for electronic functions
- comparison device with mounts for Macro-zoom objectives and the observation tube.

Coarse and fine focusing

The coaxial drive knobs (1.2 and 1.4) situated on the central control panel serve for individual focusing of the two objects being compared.

The larger inner drive knob is for coarse focusing. The smaller outer knob is used for fine focusing, which is especially useful at medium and high magnifications.

Synchronized adjustment of the two stages

Synchronized adjustment of the two mechanical stages in x direction is possible with the knurled knob (1.5). When comparing objects in split image mode, the course of toolmarks can thus be conveniently followed over a distance of 30 mm without having to change the image split point.

When using the transmitted light device, the X adjustment has to be exactly returned to its home position, i.e. in the central position.

Mechanical stages

The stage plates (3.1) of the mechanical stages are 202 mm x 140 mm in size. They have an opening in the center with a removable glass insert (3.2) for using the transmitted light device.

Fig. 3 Mechanical stage

1 Stage plate, 2 Removable glass insert, 3 Red dot on glass insert, 4 Red dot on stage plate, 5 Coaxial drive

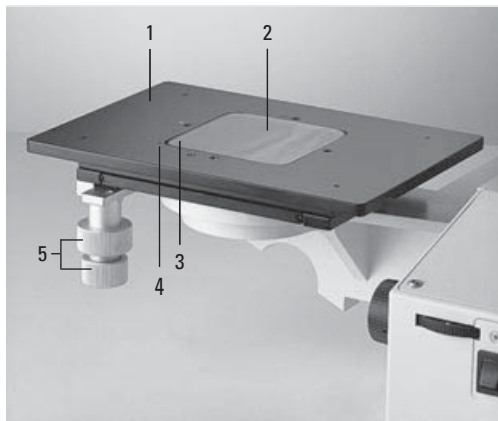
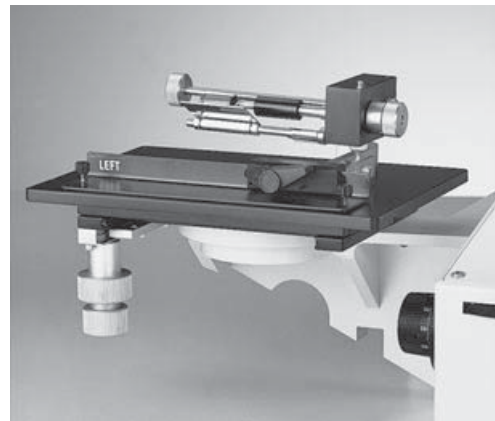


Fig. 3a Mechanical stage with bullet holder K 2715 A of Leica Microsystems Inc., Buffalo



When replacing the glass insert, make sure the red dot (3.3) in the glass insert is aligned with the red dot in the surface of the stage (3.4).

In the stage surface there are screw holes for mounting

- rotary stages
- spacer plates for affixing the adjustable holders
- bullet holder K 2715 A (3a) of Leica Microsystems Inc., Buffalo NY USA
- large-surface stages for documents.

The stage plates have an adjustment range of 50 mm x 50 mm, which is operated by ergonomically located coaxial drives (3.5).

To align the comparison objects, the right-hand stage has a limited rotation facility. After slackening the knurled screw (4.1), the stage can be rotated within a range of 15° (±7.5°). A ball catch gives the orientation to the original position.

There are two screw holes on the back of each stage bracket (5.1), where the articulated holders for the 6 V 20 W macrolamps or the flexible fiber optics can be screwed in.

The fluorescent tube lamps K 2738 (5.3) of Leica Inc., Buffalo NY USA can also be adapted here using a spacer (5.2)

Fig. 4 Mechanical stage, right view
1 Fixing screw for rotation facility, 2 Coaxial drive

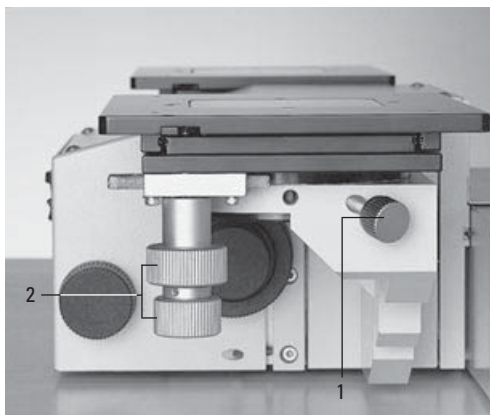
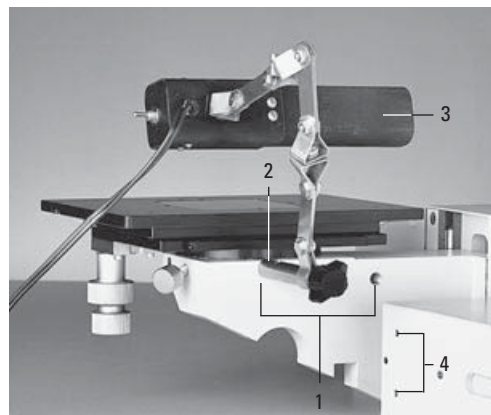


Fig. 5 Attaching the lamps to the stage
1 Screw holes for attaching the lamps, 2 Spacer, 3 Fluorescent tube lamp K 2738 of Leica Inc., Buffalo, 4 Screw holes for attaching the transmitted light device



Comparison device

The comparison device has the job of uniting the images of the objects produced by the two Macrozoom objectives in the intermediate image plane of the observation tube. When the instrument is delivered, the comparison device is firmly assembled to the height-adjustable column.

On the left and right are the dovetail ring mounts (6.1) for the objectives. The Macrozoom objectives are adapted to the mounts with the screw (6.2).

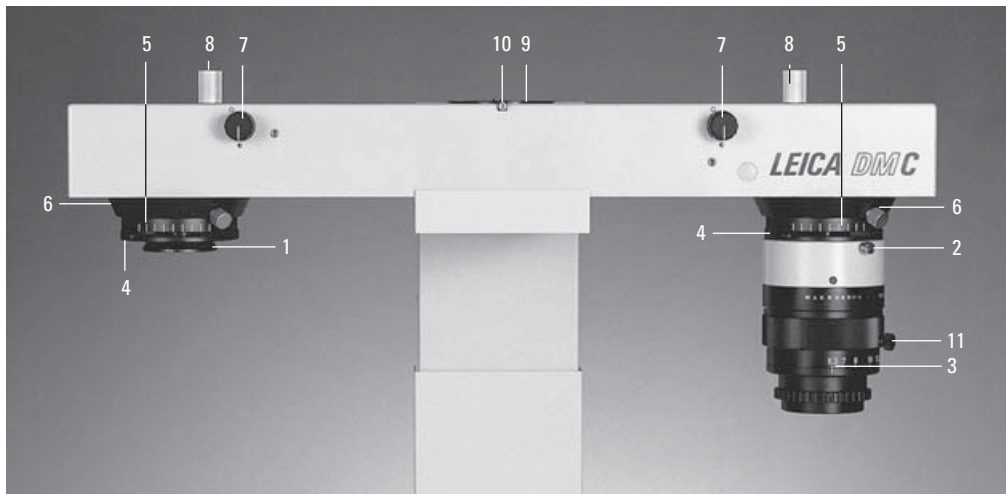
When adapting the Macrozoom objectives, there are two things to remember:

1. The Macrozoom objectives have been matched to each other when the instrument was assembled and labelled with stickers "L" (for left) and "R" (for right). They have to be assembled to the comparison device accordingly and should not be mixed up.
2. The index (6.3) for reading the magnification setting has to be aligned to face the viewer.

Above the objective mounts there are aperture diaphragms. These are used to enhance the depth of field when imaging 3D objects. The aperture of the diaphragms can be adjusted with the lever (6.4). The scale divisions (6.5) with index on the diaphragm lever allow reproducible settings of the two aperture diaphragms.

Fig. 6 Comparison device

1 Objective mount, **2** Fixing screw for Macrozoom objectives, **3** Magnification index, **4** Aperture diaphragms, **5** Aperture diaphragm scale, **6** Filter module, **7** Split/superimposed image switchover, **8** Half diaphragm adjustment, **9** Tube mount, **10** Fixing screw for binocular tube, **11** Magnification stop





Above the aperture diaphragms there are slits (7) to accommodate the slides with the color contrast filters CGA and CRA (as required for observation in superimposed image mode) and the slides with analysers for viewing in polarized light.



Attention!

When using confocal illumination, separate analysers are not used as they are already permanently integrated in the illumination system.

In the intermediate image planes of the comparison device, there are half diaphragms on both sides which can be swivelled in and out. They are operated with the black adjustment knobs (6.7) with index. The symbol  indicates split image mode, i.e. the object on the right stage appears in the left half of the image and the object on the left stage appears in the right

half of the image. The symbol  indicates that the half diaphragms that produce the dividing line in split image mode are out of the light path. This means that superimposed imaging, i.e. one image is overlaid on top of the other, is possible.

Using the chrome-plated adjustment knobs (6.8) it is possible to alter the positions of the half diaphragms within the intermediate image planes. These mechanical adjustment facilities allow the following optical effects to be achieved:

1. Alteration of the width of the dividing line in split image mode
2. Movement of the dividing line to the left or right in split image mode
3. Setting of a strip of variable width and position in which the images of the two objects overlap in split image mode.

In the center of the comparison device is the mount (6.9) for the observation tubes. After slackening the screw (6.10), the suitable observation tube for the Comparison Macroscope can be mounted here and secured by retightening the screw.

Fig. 7 Inserting the filter



Binocular tubes

Binocular tubes FSA 25 P and Ergotube C 3T 20 can be used for the Comparison Microscope.

FSA 25 P

The tubes can be used in connection with MPS microscope cameras or the photo/TV module.

Binocular observation and phototube FSA 25 P, viewing angle 30°, with 3 clickstop positions of the beamsplitter in the tube:

| Switching rod (8.1) | Observation | Photo |
|---------------------|-------------|-------|
| ├── | 100% | 0% |
| ├──├── | 50% | 50% |
| ├──├──├── | 0% | 100% |

C 3T 20

Ergonomic binocular observation and photo tube like the FSA 25 P but with 45° viewing angle. The 3 clickstop positions correspond to those of the FSA PR tube.

There are interchangeable photo adapter tubes with either vertical or both vertical and horizontal exits (9) for all FSA tubes.

3 clickstop positions for beamsplitter switching:

| Switching rod (8.1) | Observation | Photo |
|---------------------|-------------|-------|
| ├── | 0% | 100% |
| ├──├── | 50% | 50% |
| ├──├──├── | 100% | 0% |

Fig. 8 Binocular tube FSA 25 P or FSA 25 PR

1 Switching rod for beamsplitter, 2 Mount for photo tube, 3 Clamp screw for phototube, 4 Jack for control cable for the dark flap, 5 Interpupillary distance scale, 6 Eyepieces

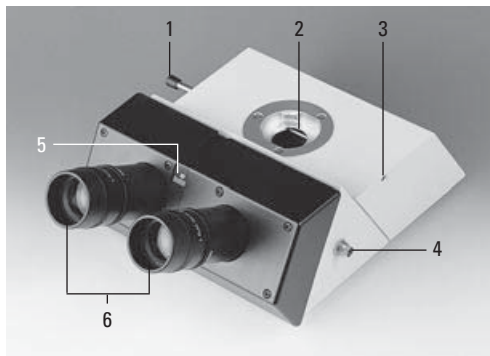


Fig. 8a Binocular phototube C 3T 20 with ergonomic viewing port



The phototubes are assembled to the comparison device as follows: Slightly slacken the clamp screw (8.3) with the 3 mm hexagonal screwdriver, removing the black cover if necessary, mount the tube and align with its edges parallel to the microscope. Retighten the clamp screw (8.3).

The vertical photo adapter tube (10) supplied with the microscope can be adapted to any of the phototubes instead of the photo adapter tube with two exits (9). This is done by slightly slackening the clamp screw (8.3) with the 3 mm hexagonal screwdriver and then retightening.


Slot the eyepieces L PLAN 10x/20  M (8.6) into the two tubes of the binocular port.

Fig. 9 Photo adapter tube with horizontal and vertical exit
1 Switching rod for beamsplitter, 2 Vertical exit, 3 Horizontal exit.

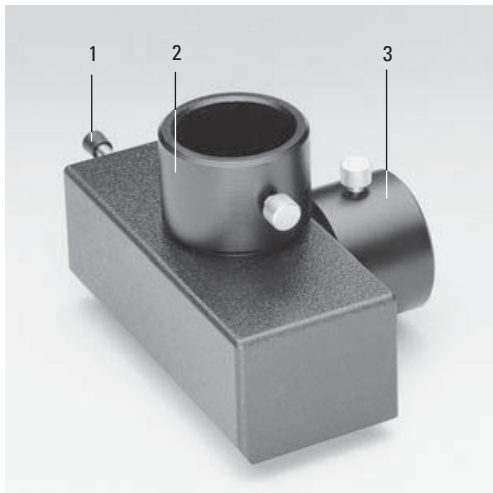


Fig. 10 Vertical photo adapter tube



Objectives

The Macrozoom objectives (11.1) with 1:5 zoom magnification have extremely long working distances, which are retained when the reproduction ratios are changed. This is the only way that cleaved objects or hollow cones such as firing pin imprints in cartridge cases or steel drill marks can be optimally illuminated with the macro lamps or fiber optics. The long free working distances of the Macrozoom objectives also facilitate the alignment of the comparison objects while observing them through the microscope.

In contrast with fixed magnification objectives, Macrozoom objectives offer virtually unlimited potential for adjusting the magnification of ei-

ther image in the case of identical traces whose dimensions are different due to deformation of one of the samples.

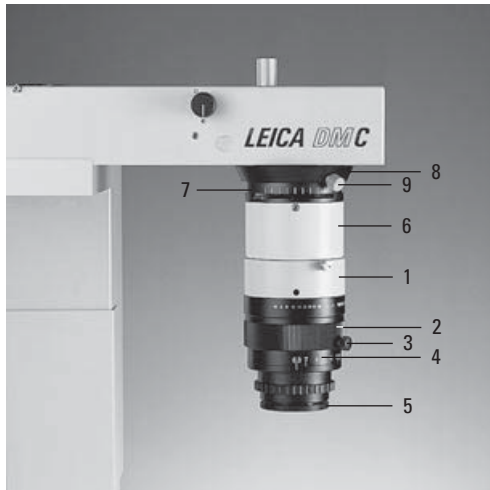
The Macrozoom objectives are fitted at the factory with clickstops at the 8x, 12.5x and 20x settings.

If the Macrozoom objectives are both set to the same reproduction ratios, the magnifications are virtually identical. This can be checked with a stage micrometer and the clickstop device readjusted if necessary (see p. 44, Care and Maintenance).

With supplementary lenses 0.5x or 2x, which can be locked onto the mounts of the front lenses of the Macrozoom objectives with a bayonet fitting (11.5), the actual magnification range of the imaging systems can be considerably extended.

Abb. 11 Makrozoom Vario-Objektiv

1 Makrozoom Vario-Objektiv, **2** Vergrößerungsverstellung, **3** Arretierung für Vergrößerung, **4** Vergrößerungsskala mit Index, **5** Aufnahmebajonett für Vorsatzobjektive, **6** Ausgleichsstück, **7** Aperturblende mit Skala, **8** drehbare Leuchtaufnahme, **9** Klemmschraube für drehbare Leuchtaufnahme



Attention!

Supplementary lenses 2x cannot be used together with the transmitted light device.



Attention!

If the supplementary lenses 2x are used without the coaxial illuminators (2x, order no. 559 007), the spacers (2x, order no. 581 013) (11.6) have to be assembled between the Macrozoom objectives and the objective mounts on the comparison device.

The magnifications that can be achieved with the Comparison Macroscope are shown in the following table.

Tube factor of the magnification device: 1.25x

| Eyepiece | Zoom setting | Macrozoom objective | | Supplementary objectives | | | |
|----------|--------------|------------------------------|----------------|------------------------------|----------------|-----------------------------|----------------|
| | | 1x | | 0.5x | | 2.0x | |
| | | Free working distance 100 mm | | Free working distance 192 mm | | Free working distance 39 mm | |
| | | Total magnification | ∅ object field | Total magnification | ∅ object field | Total magnification | ∅ object field |
| 10x | 6.3x | 8x | 25 mm | 4x | 50 mm | 16x | 12,5 mm |
| | 32x | 40x | 5 mm | 20x | 10 mm | 80x | 2,5 mm |

Eyepieces

The pair of L PLAN 10x/20 M eyepieces is suitable for eyeglass wearers. The eyecups (12.1) facing the viewer have to be removed.

The eyepieces have adjustable eyelenses (12.2). This adjustment compensates for defective eyesight when viewers who normally wear eyeglasses look through the microscope without them.

The 0 diopter setting of the eyelenses is indicated by the light ring marking (12.3) recessed in the height-adjustable shaft of the eyepiece mount.

The eyepieces can also accommodate grati- cules (12.4), e.g. for showing format outlines for photography. For this purpose, the lower part, the graticule mount (12.5), has to be screwed out of the eyepiece shaft. When inserting a grati- cule supplied with the macroscope, please re- member the following:

Fig. 12 Eyepieces

- 1 Eyecup, 2 Eyelens, 3 Ring marking for 0 diopter setting, 4 Graticule, 5 Graticule mount



1. Hold the graticule by the edge only and take care to avoid finger marks on the surface. To remove finger marks we recommend a soft, lint-free cloth, piece of leather, or, even better, optical cleaning tissue. Alcohol, benzine or acetone can be used as solvents.
2. The markings on the glass plate must face the eyelens of the eyepiece when the graticule is inserted.
3. Remove any surface dust with compressed air or a clean, soft brush.

Power supply and motorized height adjustment

The macro lamps, the coaxial illumination and the transmitted light system are all fitted with 6 V 20 W low-voltage halogen lamps. The power supply for these light sources and for the motor drive of the height adjustment of the comparison device is built into the stand of the Comparison Microscope.

There is therefore a power switch (13.1) on the front for switching off the mains current supply. To the right of this switch there is a toggle switch (13.2) with a double arrow. This activates the motorized height adjustment of the comparison device.

! Important note!

Because of the varying object heights typical of forensic applications, this motorized height adjustment facility does not have a lower stop related to the particular focal plane. It is therefore important to make sure that the front lenses of the Macrozoom objectives do not make contact with the object or are pressed against the specimens when the comparison device is lowered. We cannot accept any liability for this due to the heterogeneous nature of objects observed with the Comparison Microscope.

Fig. 13 Operation of electric functions

1 On/Off switch, 2 Toggle switch for motorized height adjustment, 3 Alternating switch (left), 4 Intensity control (left), 5 Alternating switch (right), 6 Intensity control (right)



Fig. 14 Electric connections

1-4 Sockets for 6 V 20 W halogen light sources, 5 Socket for mains cable, 6 Voltage selector and access to fuses, 7 Grounding cabinet



Illuminators

There are two ports each on the left and right of the back of the macroscope stand for connecting illumination units (14.1–4). Using the two alternating switches (13.3 and 13.5), the power supply for the 6 V 20 W low-voltage halogen lamps can be switched from the upper to the lower port (or vice versa). This allows, for example, quick switching between oblique and coaxial incident light.

The intensity of the light sources in the currently activated illuminators can be continuously adjusted with the intensity controls (13.4 and 13.6).

6 V 20 W hal. macro lamps

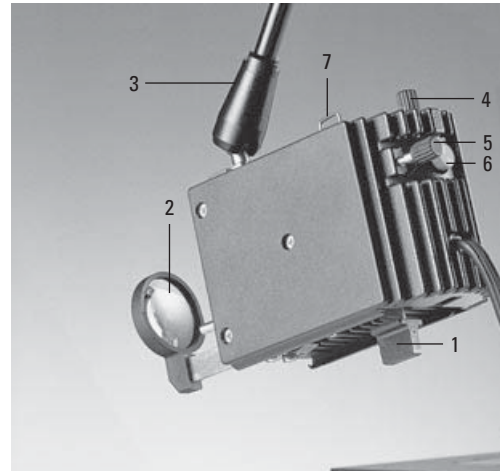
The 6 V 20 W halogen macro lamps with lockable articulated arms are intended for oblique incident light or for glancing illumination. They have a collector lens (14a.2) which can be adjusted with the handle (14a.1) for concentrating the light beam.

The articulated arms (14a.3) of the macro lamps can be attached to two locations of the Comparison Microscope.

Above each of the Macrozoom objectives there is a rotatable lamp mount (11.8) for this purpose, which can be locked with the clamp screw with thread mount for the 6 V 20 W macro lamps.

Fig. 14a 6 V 20 W halogen macro lamp

- 1 Collector lens adjustment, 2 Collector lens, 3 Articulated arm, 4 Lamp height adjustment, 5 Horizontal lamp adjustment, 6 Adjustment of the lamp in the direction of the optical axis, 7 Unlocking mechanism for opening the lamphousing



If the macro lamps are attached here, the light cones they produce can be permanently aligned to the optical axis. This means that when the position of the comparison objects is adjusted, the object field is always homogeneously illuminated. Apart from this, the rotation facility of the lamp mount allows the macro lamp to be rotated through 360° round the objects without changing the illumination angle.

There is also the possibility of screwing the articulated arms of the macro lamps into the thread (5.1) in the stage brackets. This allows the illumination to be related to the particular object, an advantage when using the supplementary lenses for the Macrozoom objectives, which change their free working distances. It is then unnecessary to correct the illumination angle of the macro lamps.

The built-in 6 V 20 W light bulb can be centered to the optical axis using the centration screws (14a.4–6). This is best done by projecting the light cone emitted by the macro lamp at a vertical surface, such as a wall. Then adjust the centering screws until you achieve homogeneous illumination right into the corners of the image. Please see Fig. 15 for how to open the lamp-housing to change the lamp bulb.

Fig. 15 Changing the bulb in the 6 V 20 W halogen macro lamp
1 Unlocking the catch on the lamphousing, 2 6 V 20 W halogen lamp, 3 Filter mount, 4 Clamp for articulated arm

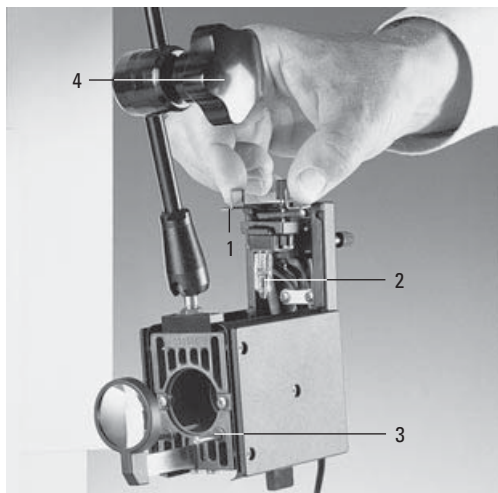


Fig. 15a Console for installing the KL 1500 electronic cold light illuminator (assembly)



Cold light illumination

The cold light illumination produced via glass fiber optics has a relatively harsh effect for objects with 3D structures. Unlike the 6 V 20 W halogen macro lamps, which provide softer light for larger areas, fiber optics are particularly good for highlighting faint 3D structures with a strong light/shadow contrast. The cold light illumination for the Comparison Macroscope is therefore a welcome addition to the range of illumination facilities.

Either one or two KL 1500 electronic cold light illuminators can be used with the Comparison Macroscope. Using two of these illuminators has the following advantages:

1. max. use of intensity and therefore bright illumination of objects
2. individual intensity control of each image

In configurations with 2 KL 1500 cold light illuminators, light is directed to the object via two one-armed flexible fiberoptic cables. If only one cold light illuminator is used, the light is directed to the object via a y-shaped fibreoptic cable with an arm length of 1 m.

The lockable articulated arms required for the fibreoptics are the same as for the 6 V 20 W macro lamps. They have a screw thread on one end with which they can be attached, as already described, to the lamp mount above the objective (11.8) or to the stage brackets (5.1).

The lockable mounts at the other end of the articulated arms are for the end of the fiberoptic cable that faces the object. After inserting this, lock it with the clamp screw.

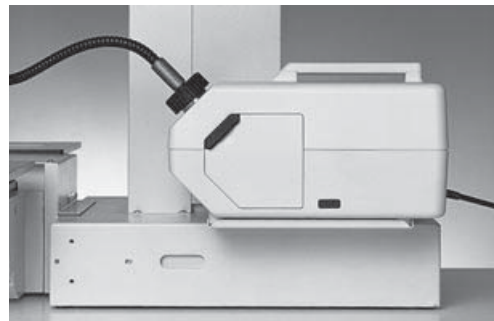
Consoles (16) are available for installing one or two KL 1500 electronic cold light illuminators. They are screwed onto the left and/or right of the base of the Comparison Macroscope (15a).

! Attention!

Please also read the instruction manual supplied with every KL 1500 electronic cold light illuminator.

Other fibre optic illuminators, e.g. with ring lamps or fiberoptic guides for glancing illumination are available on request.

Fig. 16 KL 1500 electronic cold light illuminator on a console



Coaxial illumination

The coaxial illuminator (17) is particularly useful for producing high-contrast images of flat objects with toolmarks or firearm traces and of tool- and wearmarks on plastic surfaces such as adhesive, audio and video tapes, etc. This is not possible with oblique or glancing illumination unless the objects are vacuum evaporated.

Like the macro lamps, the illuminators of the coaxial illumination system (17.1) have a 6 V 20 W halogen lamp. The functions of the lamphousing (17.2) have already been described in the section on objectives on page 15.

Before reaching the beamsplitter plate, the light from the lamphousing is polarized by a permanently integrated filter. The beamsplitter directs 50% of the light to the object through the Macrozoom objective. The light reflected by the specimens returns through the Macrozoom ob-

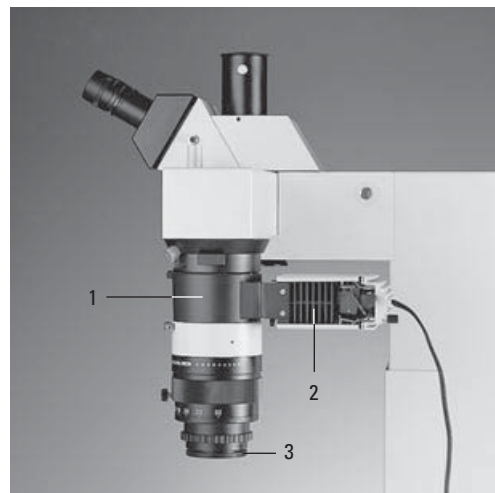
jectives to the imaging plane. On its way, the light passes through the beamsplitter plate once again and also through a permanently integrated analyser, which is only transparent for the light depolarized by the object.

The quarter-wave plates in rotary mount (17.3) belonging to the coaxial illumination system are used to enhance contrast and are therefore clamped in front of the front lenses of the Macrozoom objectives. By rotating the quarter-wave plates it is possible to adjust the contrast of each of the comparison objects separately.

The illuminators of the coaxial illumination system are assembled between the comparison device and the Macrozoom objectives as shown in Fig. 17.

Fig. 17 Coaxial illumination

1 Illuminator of the coaxial illumination, **2** Lamphousing, **3** Quarter-wave plate



UV illumination

For the UV illumination there is a special holder (18.1) which is assembled to the underneath of the bracket of the comparison device as shown in Fig. 18. The UV lamps are mounted to the bars (18.2) of this holder, aligned to the object and fixed in position.

The UV lamps are used for incident light illumination of large-area objects with fluorescent components (e.g. documents). They are fitted with a 180 W high-pressure quartz light source. A built-in fan prevents heat accumulation. The UV filters transmit light with a wavelength of 366 nm. The UV lamps (18.3) are designed for 230 V/50 Hz power supply.

! **Attention!**

If the local power supply is different to this, a transformer must be used.

Further details on application and use can be found in the manuals supplied with the UV lamps.

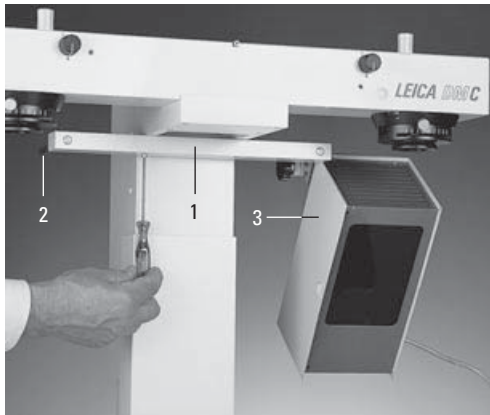


Attention!

Wear protective goggles.

Fig. 18 Assembly of UV illumination

1 Support for UV lamps, **2** Bar for affixing a UV lamp, **3** UV lamp



Transmitted light illumination

The transmitted light illumination device allows objects to be imaged in brightfield, oblique light and polarization contrast.

There are screw holes (5.4) in the sides of the macroscope base for screwing in the transmitted light device. Stabilizing pins ensure correct orientation to the imaging axis.

Assemble the transmitted light equipment to the macroscope base with the fixing screws (19.1) and connect to the sockets (14.2 and 14.3). Slide the collector lenses (19.2) in the direction of the object. Remove the glass insert (3.2) from the mechanical stage and put a condenser lens 1x (20.1) in the mount. Replace the glass insert. Note the center marking of the x adjustment (19.6) and correct the position of the two mechanical stages with the drive knob (1.5) if necessary. Lower the stage by adjusting the drive knobs (1.3). Now switch on the illumination.

Swing the diffusion disc (19.3) out of the light path. Switch off the oblique illumination with the lever (19.4). Place a piece of paper on each of the stage surfaces and adjust the 6V 20W halogen lamps with the screw (14a.6) until you obtain a sharply focused image of the lamp filaments on the paper. Use the screws (14a.4-5) to move the filament images into the centers of the illuminated pieces of paper.

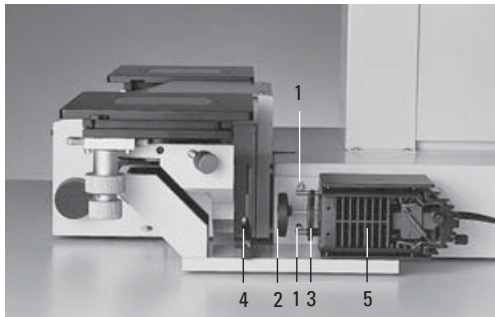
Swing the diffusion disc (19.3) back into the light path. Slide the collector lens (19.2) in the direction of the lamphousing (19.5) as far as the stop, remove the paper, put a specimen on the stage and focus.



Attention!

If using the supplementary objectives 0.5x, condenser lens 0.5x has to be used instead of condenser lens 1x. Under these application conditions, it is only possible to use the Macrozoom objectives in a magnification range between 10x and 32x.

Fig. 19 Transmitted light illumination system
1 Fixing screws, **2** Collector lens, **3** Diffusion disc, **4** Oblique illumination lever, **5** Lamphousing, **6** Center marking



The following limitations result from using the transmitted light illumination system:

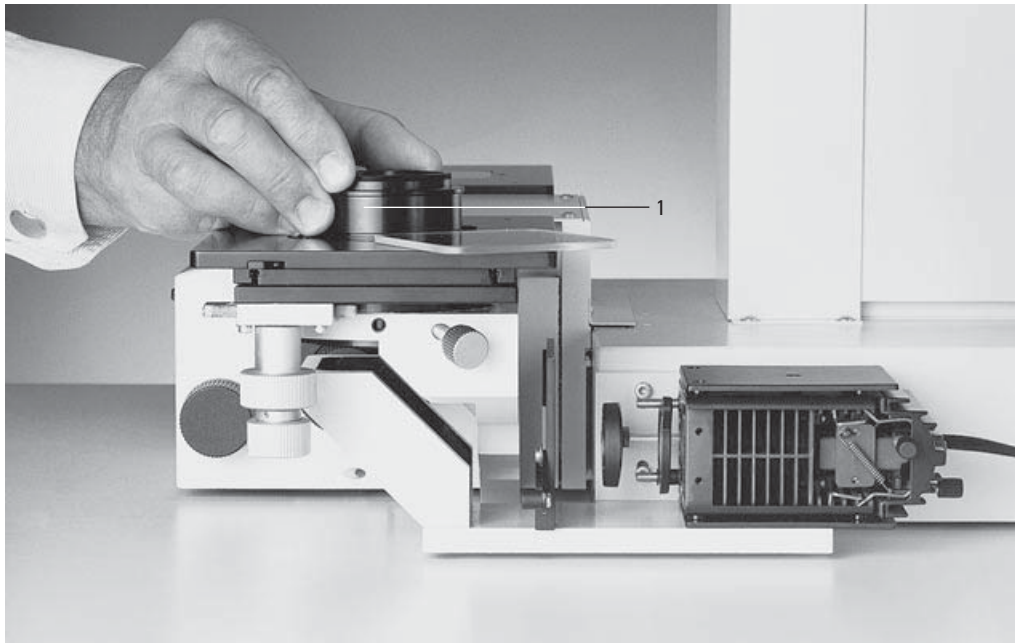
1. The coaxial illumination device or the corresponding spacers always have to be removed.
2. Using the transmitted light illumination system with the supplementary objectives 2x is not recommended.



Attention!

Ignoring these limitations may lead to difficulties with the illumination.

Fig. 20 Inserting the condenser lenses
1 Condenser lens



Desk with motorized height adjustment

The desk with motorized height adjustment is used to optimize the ergonomic conditions when working with the Comparison Macroscope.



Attention!

The worktop is 110 x 56 cm in size and is asymmetrically mounted on the height-adjustable column. When putting the Comparison Macroscope on the desk, make sure the main instrument is exactly above the column of the desk. This will leave space on the right of the worktop for setting up control units for photography or video recording.

On the base of the desk there is a socket (21.1) for the mains cable. Once connected to the power supply, the height of the worktop can be continuously adjusted in a range between 60 and 80 cm over the floor. The height adjustment is operated with the toggle switch (21.2).

The speed of the vertical adjustment is about 12 mm/sec. The force of the vertical movement is 2000 N.

If the floor under the desk is not exactly flat, differences in level can be compensated by screwing the adjustment elements (21.3) on the base of the desk in or out as required.



Attention!

The desk does not have a switching facility for different mains voltages. There are therefore different versions for 230 V/50 Hz and 120 V/60 Hz.

Fig. 21 Desk

1 Socket for mains cable, **2** Toggle switch for height adjustment, **3** Adjustment elements



Mountable stages

Rotary stages \varnothing 118 mm

These rotary stages (22.1) can be mounted to the mechanical stages of the basic configuration with two Allen screws. They are suitable for both incident and transmitted light examinations. The rotary stages each have an opening in the middle which is closed with a removable glass insert (22.2). The screw holes in the stage surfaces are for screwing in the adjustable holders. There are also holes for slotting in the object clamps. The rotation of the stage surface can be locked with a fixing screw (22.3).

The lower parts of the rotary stages have slits (22.4) for inserting polarizers (23.1) with whole-wave plates (1st order red). These can be rotated by 90° .

Fig. 22 Rotary stage \varnothing 118 mm (assembly)

1 Rotary stage plate, 2 Removable glass insert, 3 Fixing screw, 4 Slit for polarizers

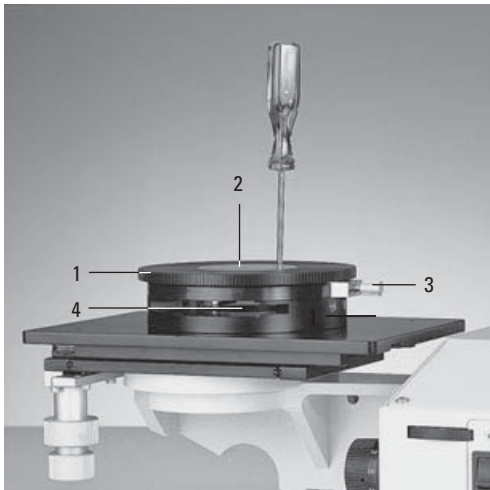


Fig. 23 Rotary stage \varnothing 118 mm with polarizer inserted

1 Polarizer, 2 Transmitted light illumination device



Spacer plates

If the rotary stages described above are not available, the adjustable holders can be secured to the mechanical stages using the spacer plates (24.1).

There is a conical drill hole (24.2) in the center of the spacer plate which accommodates, like the adjustable holders, any of the object mounts such as those for sporting cartridge cases (25a.1).

Stages for large objects

The stages for large objects can be mounted straight onto the mechanical stages. They are primarily intended for documents, which can be securely fixed in position and spread flat with the enclosed magnets.

Of course, these stages can also be used to support other large objects with toolmarks, for example.

When using the stages for large objects there is not enough room to attach the lamp holders to the stage brackets.

Fig. 24 Spacer plate (assembly)
1 Spacer plate, 2 Conical drill hole

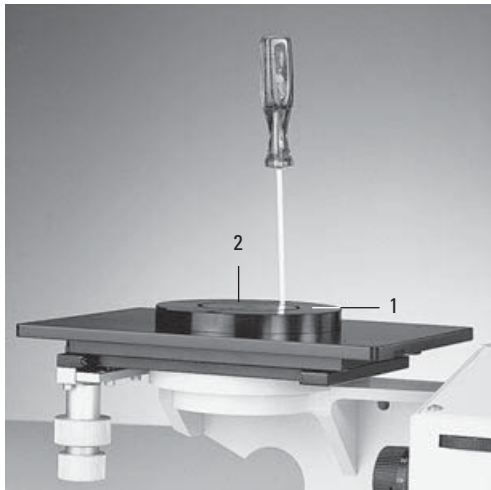
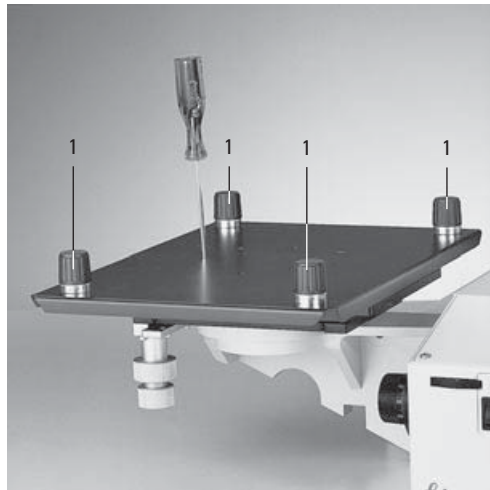


Fig. 25 Stage for large objects (assembly)
1 Magnets



Rotary and tilting stages \varnothing 75 mm

The rotary and tilting stages are also screwed straight onto the mechanical stages. After releasing the lever (26.1) they can be rotated horizontally and tilted by an angle of up to 45° via the built-in ball joint (26.2). After positioning the comparison objects, the clamps have to be closed with the lever.

The surfaces of the stages have a diameter of 75 mm and grooves (26.3) for securing objects with plasticine. There are also 4 drill holes to accommodate object clamps (26.4).

There is a conical drill hole (26.5) in the center of the stage plate which accommodates, like the adjustable holders, any of the object mounts.

Fig. 25a Spacer plate

1 Mount for sporting cartridge cases

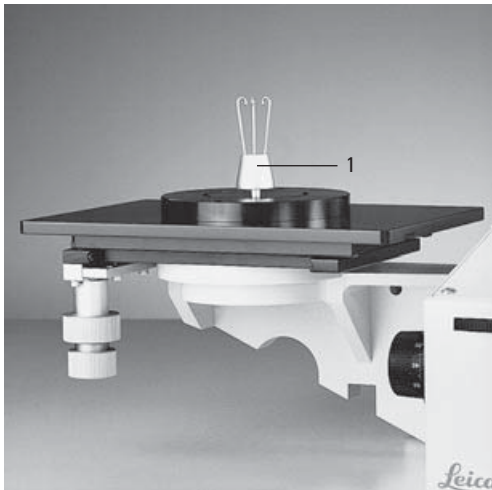
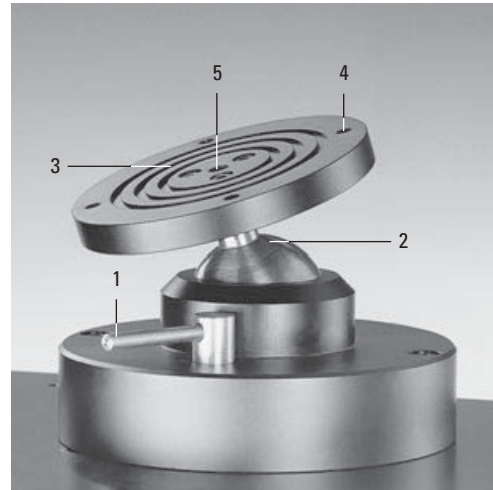


Fig. 26 Rotary and tilting stage \varnothing 75 mm

1 Clamp lever, 2 Ball joint, 3 Grooved surface, 4 Drill hole for object clamps, 5 Conical drill hole



Object holders

Adjustable holders

The adjustable holders (27.1) which can be adjusted sideways after slackening the clamp screws (27.2), for example for long objects clamped horizontally, are attached to the stage with two screws (27.3).

The chuck (28.1) can be adjusted in the segmental guide up to an angle of 90° after slackening the clamp screw (28.2). The chuck itself has a rotary device with scale division (28.3) and can be fixed in position with the clamp screw. The conical drill hole of the chuck (28.1) accommodates the following object mounts.

Fig. 27 Adjustable holder

1 Adjustable holder, 2 Side adjustment clamp, 3 Fixture on stage

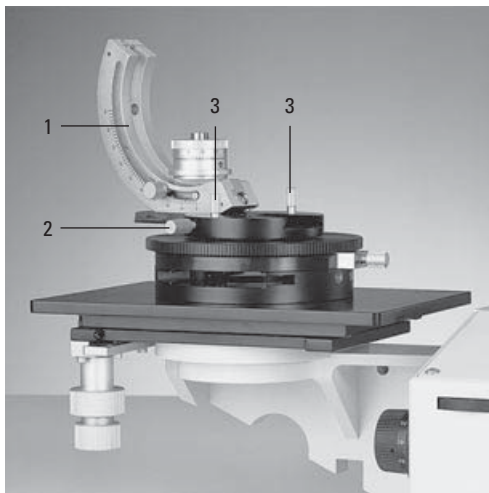
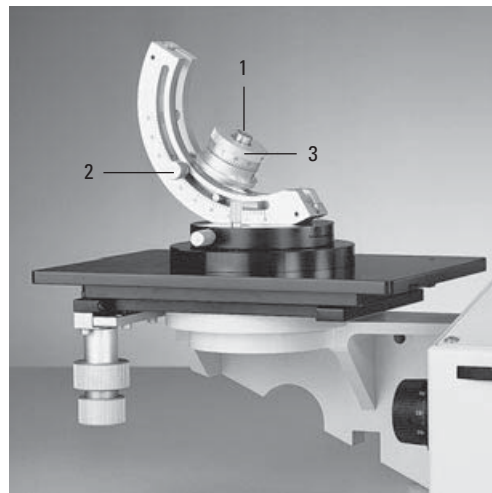


Fig. 28 Adjustable holder

1 Chuck, 2 Clamp screw, 3 Rotary device with scale division



Bullet holder

To assemble the bullet holder (29.1), push the chuck downwards in the segmental guide as far as the "0" marking. Insert the bullet holder vertically into the chuck and secure with the knurled screw (29.2). Put the chuck back in its horizontal position (by pushing upwards as far as the 90° marking) and press the rubber-armored pressure plate (30.1) into the conical drill hole of the chuck. After slackening the clamp screw (30.2) the centering insert (30.3) in the bullet holder can be horizontally adjusted to adapt to the length of the projectiles to be compared.



Attention!

Before disassembly, ensure that there is enough space between the bullet holder and the objective.

Fig. 29 Adjustable holder with bullet holder (assembly)
1 Bullet holder, 2 Fixing screw

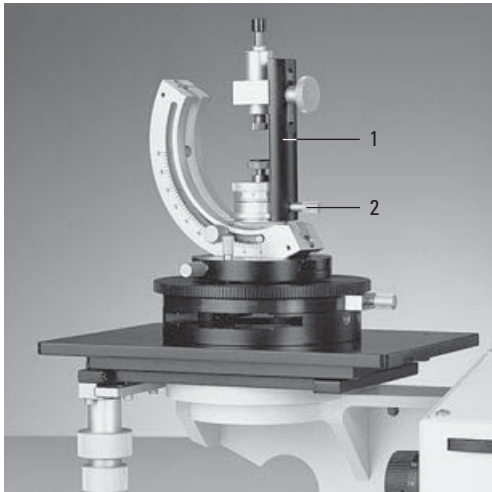
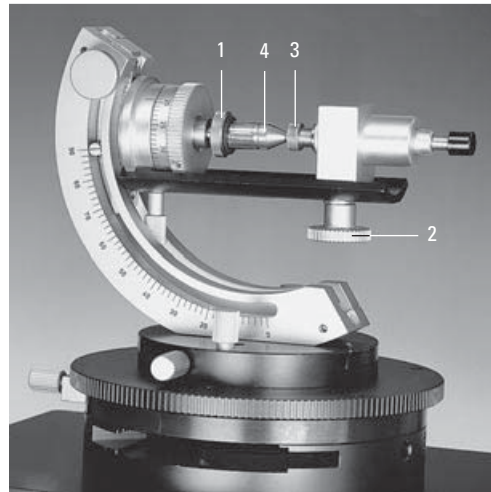


Fig. 30 Adjustable holder with bullet holder
1 Rubber armored pressure plate, 2 Clamp screw, 3 Centering insert with spring, 4 Bullet



Cementing cylinder for bullets

The cementing cylinders (31.1) are particularly useful for examining deformed bullets which neither fit in the bullet holders nor the mounts for deformed ammunition. They can be cemented to the cylinders with glue or picein. Cementing cylinders are available with diameters of 5, 6, 8 or 10 mm.

Mounts for deformed bullets

The mounts for deformed bullets (32.1) are intended for holding deformed bullets that cannot be held by the mounts described above. They have hollows to provide adequate stability for such objects.

Fig. 31 Adjustable holder with cementing cylinder for bullets
1 Cementing cylinder, 2 Bullet

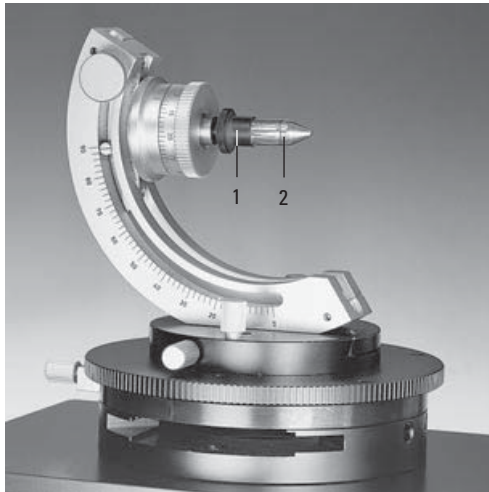
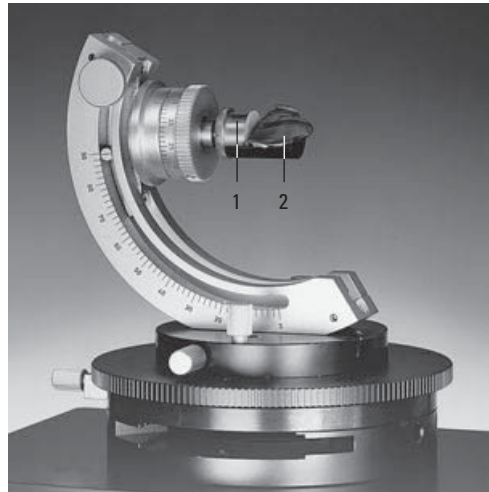


Fig. 32 Adjustable holder with mount for deformed bullets
1 Mount for deformed bullets, 2 Deformed bullet



Slot-on mounts for cartridge cases

These slot-on mounts (33.1) are designed for undamaged cartridge cases of different calibers. With their plastic holders, they are ideal for holding cartridge cases (33.2). The calibers are marked on the back of the mounts. Worn holders can be replaced: spare parts are included in the delivery.

Slot-on mounts for air gun ammunition

The stainless steel pyramids (35.1) are used for mounting air gun ammunition (horizontal position).

Fig. 34 Adjustable holder with slot-on mount for cartridge cases (horizontal position)

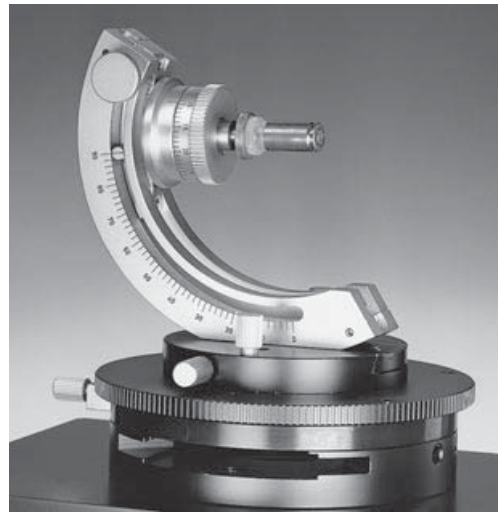


Fig. 33 Adjustable holder with slot-on mount for cartridge cases (vertical position)

1 Slot-on mount, 2 Cartridge case

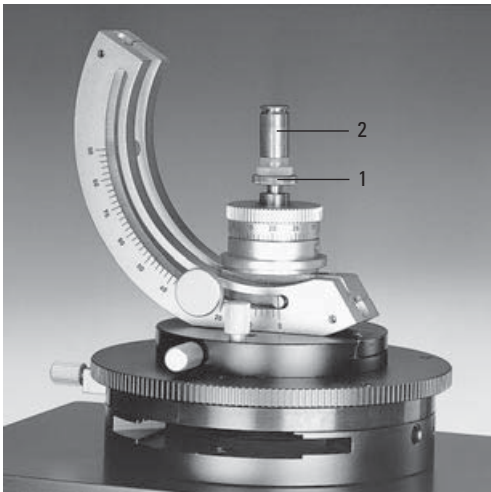
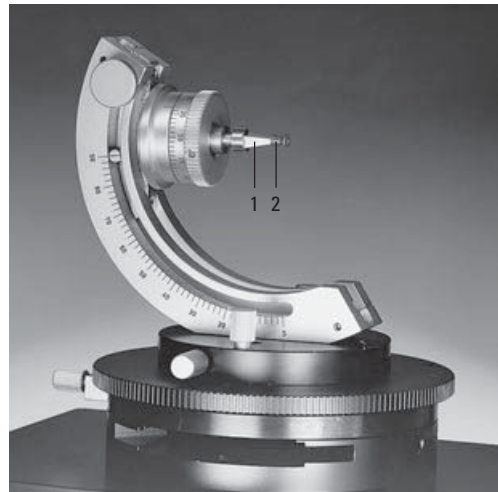


Fig. 35 Adjustable holder with slot-on mount for air gun ammunition

1 Slot-on mount, 2 Air gun ammunition



Sporting cartridge holders

The sporting cartridge holder (36.1) has three spring pins with rounded ends (36.2) onto which the cases of sporting cartridges (37.1) can be mounted. The conical base (37.2) is used for centration of the cartridge cases.

Wire holder

The wire holder (38.1) is used for clamping round parts which may have a diameter between 0.6 mm and 8 mm, e.g. for examining cutting marks.

Mounts for lock cylinders

These mounts (39.1) are designed for examining toolmarks on cylinders of safety locks that have been forced open. The cylinders are affixed with a layer of plasticine.

Fig. 36 Adjustable holder with sporting cartridge holder
1 Sporting cartridge holder, 2 Spring pins

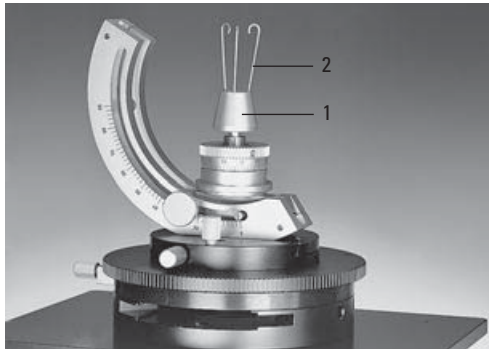


Fig. 38 Adjustable holder with wire holder
1 Wire holder, 2 Wire

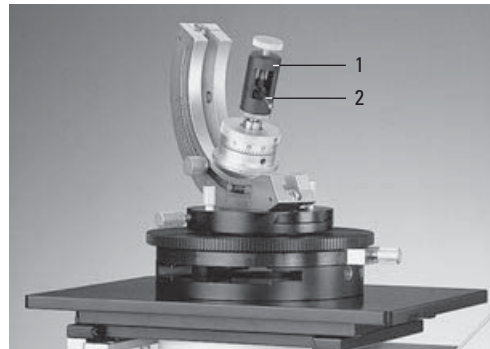


Fig. 37 Adjustable holder with sporting cartridge holder
1 Sporting cartridge, 2 Conical base

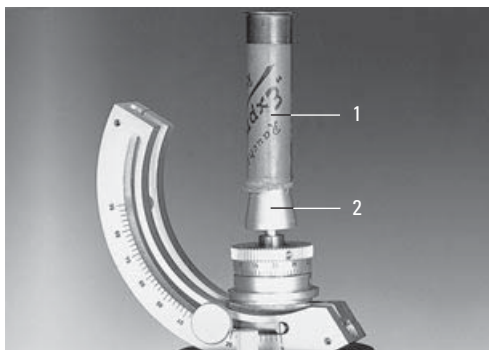
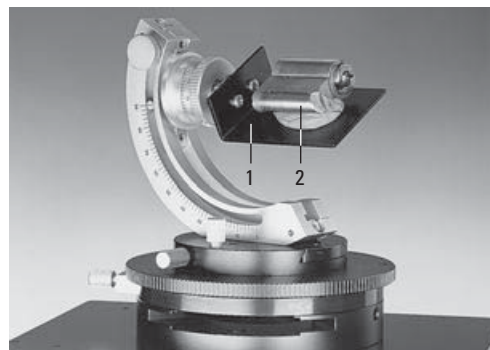


Fig. 39 Adjustable holder with mount for lock cylinders
1 Mount for lock cylinders, 2 Lock cylinder that has been forced open.



Stages \varnothing 20 mm

Objects of various sizes can be attached to the grooved surfaces of the stages \varnothing 20 mm (40.1). Either plasticine or wax is suitable as a fixing medium.

Stages \varnothing 60 mm

Objects up to 55 mm long and up to 15 mm thick can be held on the stages \varnothing 60 mm (41.1) with clamps (41.2). This is done by slackening the screws (41.3), pushing up the clamps, putting on the objects and pressing the clamps against them before retightening the screws. The additional threads (41.4) on the edge of the stages \varnothing 60 mm are for asymmetrical arrangement of the clamps. If these are removed, the stages \varnothing 60 mm can also be used as large cementing stages. Objects of various sizes can be secured to the grooved surface of the stage with plasticine.

Fig. 40 Adjustable holder with stage \varnothing 20 mm
1 Stage \varnothing 20 mm, 2 Articulated holder

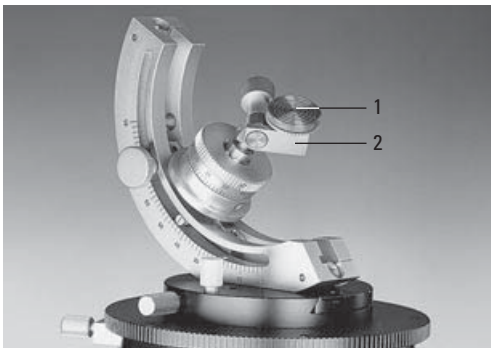
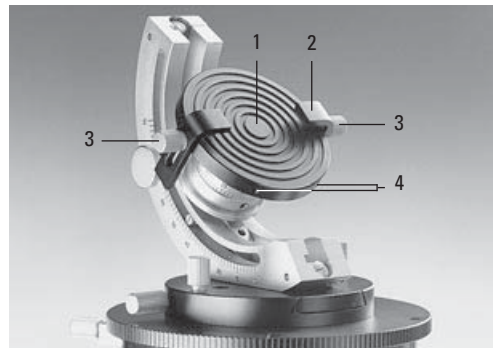


Fig. 41 Adjustable holder with stage \varnothing 60 mm
1 Stage, 2 Clamp, 3 Fixing screw, 4 Threads



Stages Ø 25 mm with ball joint

The stages Ø 25 mm with ball joint (42.1) can either be mounted to the chuck of the adjustable holders or the spacers (43).

After slackening the clamp screw (42.2) on the ball joint, the stage surface, which has a grooved profile, can be tilted as required. After aligning the object, retighten the clamp screw (42.2).

Fig. 42 Adjustable holder with stage Ø 25 mm with ball joint
1 Stage Ø 25 mm with ball joint, 2 Clamp screw

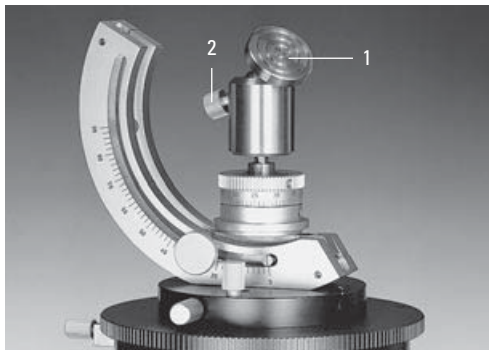
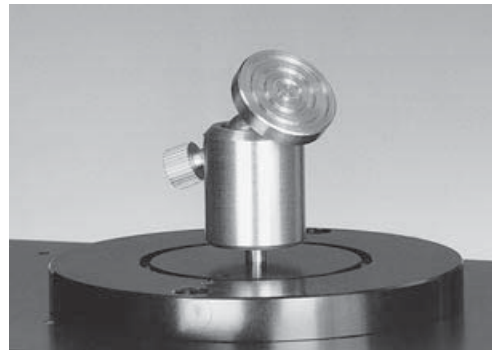


Fig. 43 Spacer plate with stage Ø 25 mm with ball joint



Articulated holders

If, for example, you want to compare cartridge case shells, profiles of firing pin imprints on the detonating caps or extractor hook markings successively without reclamping, you need articulated holders (44.1). The joint is fixed with a knurled screw (44.2).

The articulated holders are used as spacers for the previously mentioned mounts, with the exception of the bullet holders. Besides the adjustment possibilities of the adjustable holders, they also provide an object rotation and tilting facility. The inclination of the objects can be locked with the knurled screw (44.2).

Fig. 44 Adjustable holder with articulated holder
1 Articulated holder, 2 Fixing screw

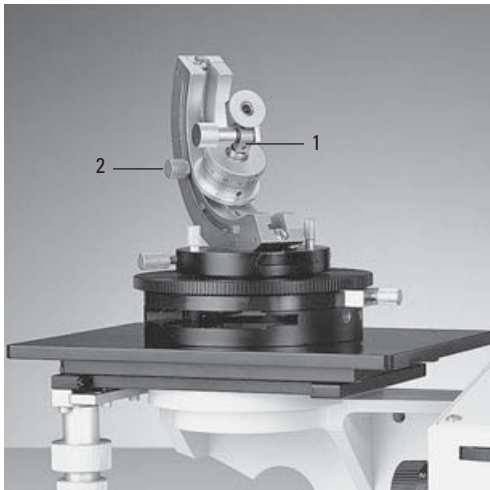
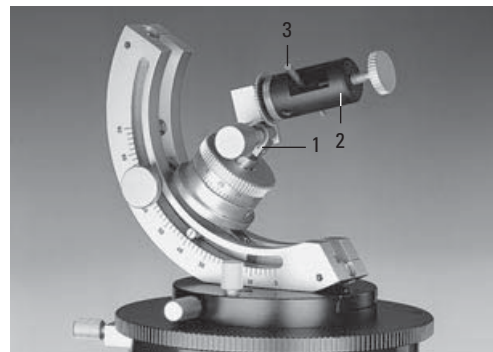


Fig. 45 Adjustable holder with articulated and wire holders
1 Articulated holder, 2 Wire holder, 3 Clamped wire



Accessories

Color contrast filters

For color differentiation of the deviations of two comparison objects there are two filters in slides: CRA (red) and CGA (green). They are slotted into the filter mounts (6.6) above the aperture diaphragms on the comparison device.

To set a color contrasted superimposed image, first set the knobs on the comparison device at superimposed image mode (symbol \odot).

When the main structures of the comparison objects are superimposed, the objects are only imaged in their original color where details exactly coincide.

Deviations are shown in either red or green, depending on which filter is assigned to which light path.

For this purpose it is necessary to carefully match the intensities of the light sources.

Polarization outfits

There are polarization outfits both for the KL 1500 electronic cold light sources and for the transmitted light device for use on the Comparison Macroscope.

The analysers in the slide are the same for both polarization devices. They are slotted into the filter mounts (6.6) above the aperture diaphragms of the comparison device. They are not needed if the coaxial illumination device with permanently integrated analyser is assembled between the Macrozoom objectives and the comparison device.

If using the rotatable polarizers for cold light illumination, the focusing lenses first have to be assembled to the ends of the fiberoptic cables. Then the rotatable polarizers are screwed into the thread in front of the focusing lenses. By rotating the polarizers it is possible to reduce disturbing highlights caused by shiny object structures.

Before using the polarizers with whole-wave plates for the transmitted light device, mount the rotary stages \varnothing 118 mm onto the mechanical stages (see p. 30). In the lower part of the rotary stages there is a filter mount (22.4) into which the polarizer with whole-wave plate should be slotted. This mount allows the polarizer with whole-wave plate to be rotated horizontally through 90° to set the desired polarization contrast.

Object scales

As already mentioned on page 15, the Macrozoom objectives have already been paired according to their optical properties under consideration of admissible tolerances when the Comparison Macroscope was assembled. At the same magnification settings, therefore, the reproduction ratios produced coincide within the admissible tolerances.

However, if greater accuracy is required for imaging two comparison objects, the object scales can be used to exactly match the magnifications of the two Macrozoom objectives.

For this it is necessary to produce a split image of the two object scales, with identical reproduction ratio settings on the Macrozoom objectives, and make them coincide. If there is still a slight deviation, this can be corrected by slight adjustment of the zoom optics of one of the Macrozoom objectives.

As the admissible tolerances for differences in magnification between the two Macrozoom objectives are kept extremely small, these adjustments are not required in normal operation of the Comparison Macroscope.

Care and maintenance

Dust protection



Attention!

Before cleaning and maintenance work, remember to disconnect from the mains!

Protect the microscope and peripherals from dust by putting on the flexible dust cover after each work session. Dust and loose particles of dirt can be removed with a soft brush or lint-free cotton cloth.

Solvents

Obstinate dirt can be removed with a clean cotton cloth moistened with any ordinary hydrous solution, benzine or alcohol. Do not use acetone, xylol or nitro dilutions. Cleaning agents of unknown composition should be tested on an inconspicuous part of the microscope. Painted or plastic surfaces must not be tarnished or etched.

Acids, alkaline solutions

Particular care should be taken when working with acids or other aggressive chemicals. Always avoid direct contact between such chemicals and the optics and mechanical components. Protect electrical components from damp. Thorough cleaning after use is strongly recommended. Keep the microscope optics meticulously clean.

Readjustment of clickstop devices

Preparatory work

Slacken screws (46.1) and remove the Macrozoom objectives (46.2) from the comparison bridge.

Completely remove the screws (46.1).

Screw the covers off the clickstop devices (47.1).

Replace the screws (46.1).

Mount the Macrozoom objectives (46.2) back onto the comparison bridge (46.3) and tighten the screws (46.1).

Put stage micrometers on both stages and form an image of them in split image mode of the comparison bridge.

Align the scale division of the stage micrometers along the dividing line between the two part images as shown in Fig. 48.

Fig. 46



Fig. 47



Adjustment of the upper and lower stop

Turn the magnification adjustment of the Macrozoom objectives (49.1) as far as the lower stop (49.2) and check the magnifications of the imaged stage micrometers.

If there is a difference in magnification, slacken the screws of both lower stops (49.3–4).

Adjust both the Macrozoom objectives (49.1) in the low magnification range until the two stage micrometer images (48) appear in the same reproduction ratio.

Adjust the lower stops (49.2) until they lie against the clickstop spring (49.5).

Tighten the screws (49.3 and 49.4).

Proceed in the same way for readjustment of the upper stop of the magnification setting.

Fig. 48

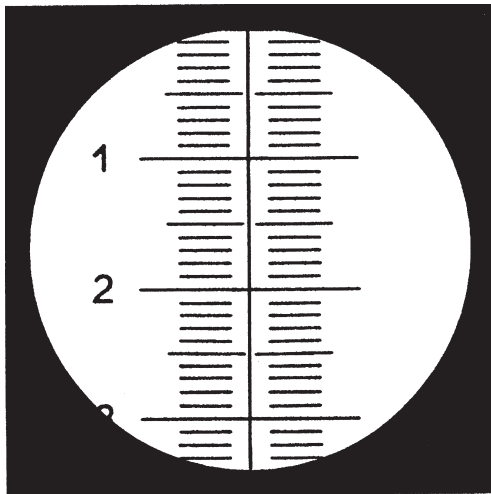


Fig. 49



Adjustment of the intermediate magnifications

Turn the magnification setting of the Macrozoom objectives synchronously from the upper stop to each of the intermediate clickstops (50.1) which are fixed at the engravings 20, 12.5 and 8 and check that the reproduction ratios are identical.

If not, slacken the screws (50.2 and 50.3) at the intermediate clickstops concerned (50.1) and adjust the magnification setting of the Macrozoom objective at the clickstop position until the reproduction ratios of the two stage micrometers are the same (see Fig. 48). Then retighten the screws (50.2 and 50.3).

Fig. 50



Concluding work

Slacken the screws (46.1) and remove the Macrozoom objectives (46.2) from the comparison bridge (46.3).

Unscrew the screws (46.1).

Screw the covers (47.1) back onto the clickstop devices.

Replace the screws (46.1).

Mount the Macrozoom objectives (46.2) back onto the comparison bridge (46.3) and secure with the screws (46.1).

n.b.: The index (50.4) must face the front.

Allocation of coaxial illumination and quarter-wave plates

The coaxial illuminators are marked UNIT A and UNIT B. Equally, the quarter-wave plates are labelled USE FOR UNIT A and USE FOR UNIT B. To ensure visibly identical color between the two part images, make sure during assembly that the quarter-wave plates are allocated to the corresponding coaxial illuminators.

Wearing and spare parts

| | Order number Part number | Name | Use |
|-------------|-----------------------------|--------------------|--|
| Spare lamps | 500 245 | Halogen lamp | Macro lamps, coaxial illumination, transmitted light illumination |
| | 500 315 | Halogen lamp | Cold light illumination |
| Spare fuses | 826-252.000-000 | T 800 mA DIN 41662 | Base plate |

EU Conformity declaration

We hereby declare that the product specified below conforms in its design and construction as well as the model we have put on the market to the relevant safety and health regulations laid down by the European Union. This declaration will cease to be valid if the instrument is modified without our consent.

Product name: DMC

Instrument type: Makroskop

Instrument no.: 581000

EU directives: Low voltage 73/23/EWG
Electromagnetic compatibility:
89/336/EWG

Harmonised standards applied:
EN 61010-1 : 1993
EN 50081-1 : 1992
EN 50082-1 : 1997

Wetzlar, 28. 7. 2000

Dr. Lucius Renner
Director of Microscopy Technology
and Development Engineering

All Leica products are made and tested with great care. If you do have cause for complaint, however, please do not try to repair the instruments and their accessories yourself. Contact your nearest Leica agency or our main technical service center in Wetzlar direct.

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