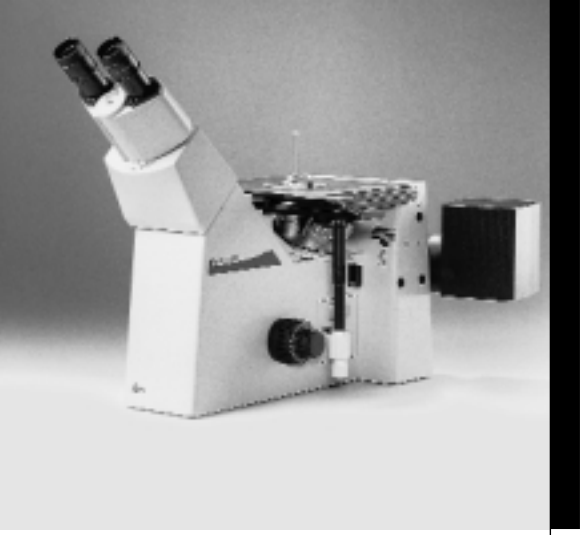

# Leica
# DM IRM

Inverted Research Microscope
for Material Testing

Instructions

Leica

Issued in 1998 by:

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# Copyrights



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.

# Contents

# 1 Important notes on this manual

This manual is divided into 7 main chapters:

1 Important notes
2 Description and technical data of the microscope
3 Assembly of the microscope
4 Start-up and operation
5 Accessories
6 Care and maintenance
7 Conformity declaration

There are 6 basic variants of the Leica DMIRM microscope, which can be configured individually.
Information on equipping the microscope further can be found in this manual or the supplied "Optics" data sheet.
Some accessories such as photomicrography have their own separate manuals.

**This manual is an integral part of the product and must be read carefully before you start using the microscope.**

**Text symbols and their meaning:**

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

As for e.g. mechanical and electrical hazards, laser, UV light, heat, danger of explosion

Warning of hot surface

Explanatory note

**!**

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

*****

Not part of all configurations/ option

**→ S. 20**

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

**(1.2)**

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

# 2 Intended application, short description and technical data of the microscope

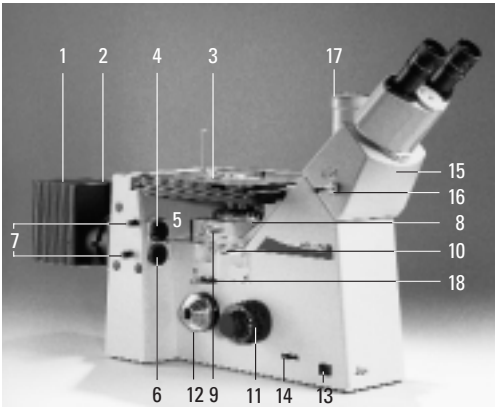



**Fig. 1** Leica DM IRM inverted microscope
**1** Lamphousing 106Z with Hg 100 W lamp, **2** Mirrorhousing for 2 lamphousings, **3** 3-plate x/y stage 247 x 230 mm, adjustment range x–y 60 x 40 mm with coaxial drive, **4** Aperture diaphragm adjustment, **5** Aperture diaphragm centration screws, **6** Field diaphragm adjustment, **7** Field diaphragm centering buttons, **8** Quintuple objective nosepiece, non-interchangeable, with M32 x 0.75 mm objective thread, **9** ICR prism dial, **10** Reflector dial, **11** Coaxial coarse and fine drive, **12** Lateral TV port, **13** Mains switch for integrated 12 V 100 W switch mode power supply, **14** Brightness adjustment of 12 V 100 W lamp, **15** Trinocular tube HCI 3T 22, 45° viewing angle, **16** Switch lever for splitting light beam 100 %/100 % or 50 %/50 %, **17** Adapter tube for photo/TV connection, **18** Analyser slot

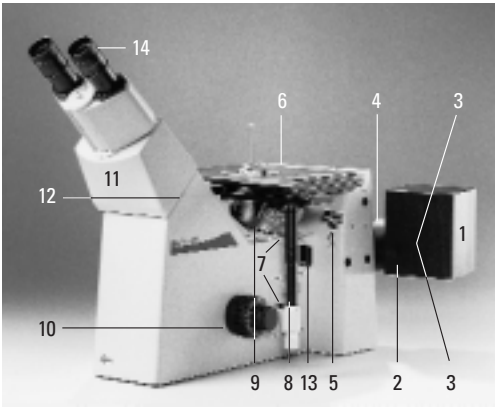



**Fig. 2** Leica DM IRM inverted microscope
**1** Lamphousing 107 for left-handed operation, **2** Collector adjustment for lamp centration, **3** Lamp centration screws, **4** Lamp mount for 1 lamphousing, **5** Switch lever for light filters, **6** 3-plate x/y stage 247 x 230 mm, x–y adjustment range 60 x 40 mm with coaxial drive, **7** Switch lever for lateral TV port, 80% TV or 100% TV, **8** Tube lens module 1x or magnification changer 1 x, 1.5 x, **9** Quintuple objective nosepiece, non-interchangeable with M32 x 0.75 mm objective thread, **10** Coaxial coarse and fine drive, **11** Binocular tube HCI B 22 with 45° viewing angle, **12** Clamp screw for changing and securing the tube, **13** Incident light polariser slot, **14** HC PLAN 10x/22 eyepieces

**Intended application:**

The Leica DM IRM is designed for metallographical test laboratories for material control and research of opaque and transparent industrial materials.

**For indoor use only**

| | |
|---|---|
| Ambient temperature: | 10 °C–36 °C |
| Relative humidity: | 0–80 % up to 30 °C |
| Integrated power supply | |
| Mains voltage: | 90–250 V |
| Frequency: | 50–60 Hz |
| Power consumption: | max. 160 W |
| Fuses: | T 4 A |
| Overvoltage category: | II |
| Contamination class: | 2 |

**The following variants of the Leica DM IRM microscope are available:**

Leica DM IRM with tube optics oo/1x HC
with lateral photo/TV exit
100 % vis–20 %vis/80 %TV Order no. 571004

Leica DMIRM with tube optics oo/1 x HC
with lateral photo/TV exit
100 % vis–100 %TV Order no. 571005

Leica DMIRM with tube optics oo/1 x, 1.5 x HC
(magnification changer)
with lateral photo/TV exit
100 % vis–20 %vis/80 %TV Order no. 571006

Leica DMIRM with tube optics oo/1 x, 1.5 x HC
(magnification changer)
with lateral photo/TV exit
100 % vis–100 %TV Order no. 571007

Leica DMIRM with tube optics oo/1 x, 1.5 x, B
(magnification changer with Bertrand lens)
with lateral photo/TV exit
100 % vis–20 %vis/80 %TV Order no. 571008

Leica DMIRM with tube optics oo/1 x, 1.5 x B
(magnification changer with Bertrand lens)
with lateral photo/TV exit
100 % vis–100 %TV Order no. 571009

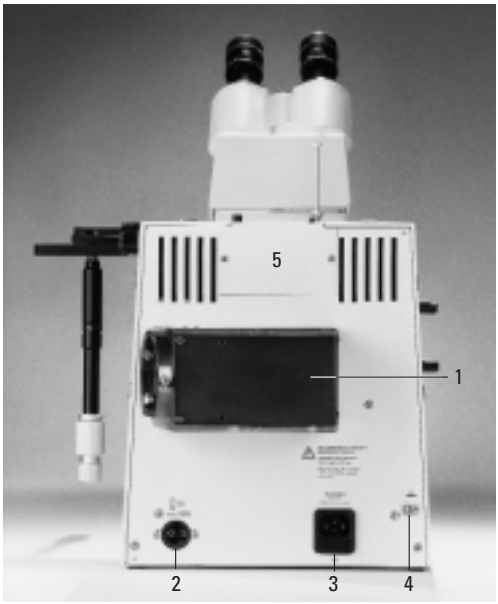



**Fig. 3** Back view of microscope
**1** Lamphousing mount, **2** 12 V 100 W socket, **3** Mains socket, **4** Potential equalisation socket, **5** Cover for transmitted light arm

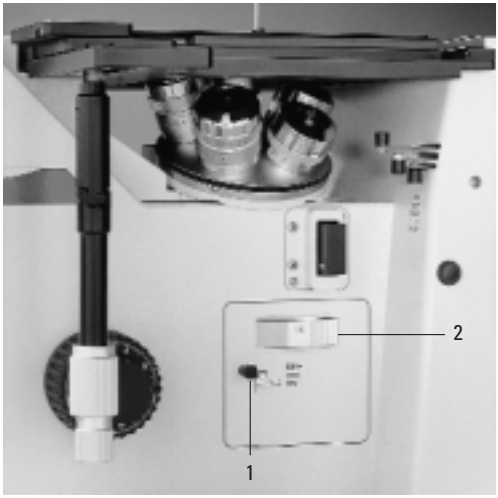



**Fig. 4** Side view of microscope
**1** Switch rod for lateral photo/TV port 100 % vis/20 % vis–80 % photo/TV or 100 % vis/100 % photo/TV, **2** Adjustment wheel for tube lens 1 x, 1.5 x Bertrand lens

# 3 Assembling the microscope

## 3.1 Unpacking, installation site, assembly tools, safety information

**Unpacking:**

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.

**n.b.!**

When lifting the microscope out of the packaging do not touch any movable, mechanical components.
When putting the microscope on the desk and adjusting its position, make sure not to damage the sensitive damping feet on the underneath of the microscope.

**n.b.!**

Do not connect microscope and peripherals to mains yet (see section 3.2, Assembly)

**Installation site**

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

**Assembly tools**

Installation and assembly of the microscope should preferably be carried out together with a member of Leica sales or service staff.
Only a few ordinary screwdrivers are required for assembly, and these are supplied with the microscope.

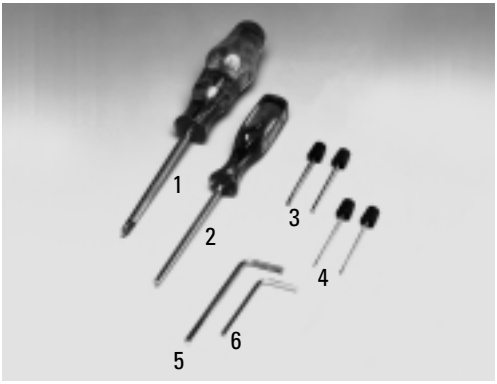



**Fig. 5** Assembly tools
**1** Cross-tip screwdriver*, **2** Hexagonal screwdriver, 3 mm, **3** Centring keys, 2 mm*, **4** Centring keys, 1.5 mm*, **5** Allen key, 3 mm*, **6** Allen key, 2.5 mm* (short version)

**Safety information**

This instrument of safety class 1 has been built and tested according to EN 61 010-1/IEC 1010-1 safety standards for electrical measurement, control and laboratory equipment.

**n.b.:**

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

The mains plug must only be inserted into a grounded outlet.

If an extension cord is used, it must be grounded as well. Any interruption of the ground connector inside or outside the microscope or disconnecting the ground connector can render the microscope potentially dangerous. Intentional severance is forbidden!

**n.b.:**

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.

**n.b.:**

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.

**n.b.:**

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.

**n.b.:**

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

**n.b.:**

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

**n.b.:**

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

### 3.2 Assembling the lamp mount, mirror housing, lamphousing, illumination telescope

1 Insert the lamp mount or the mirror housing in the back panel and screw down with Allen screws. Make sure the guide pin of the lamp mount (7.1) engages in the back panel of the microscope (6.2).
2 Put lamphousing 107/2, 107, 106Z onto the lamp mount and screw down with the fixing screw (9).
3 If you are using gas discharge lamps in connection with fluorescence techniques we recommend you use the illumination telescope (8.4). This is inserted between the lamp mount and the lamphousing 106Z and magnifies the image of the focal point of the lamp by the factor 2x in the entrance pupil of the objective. This results in substantially higher illumination intensity for fluorescence.
3 Plug the lamp plug into the socket on the microscope stand (6.3).
4 Insert a 50 mm light filter in each of the 2 filter slots on the lamphousing mount (7.4)
4 Connect the mains cable to the mains socket in the microscope stand.

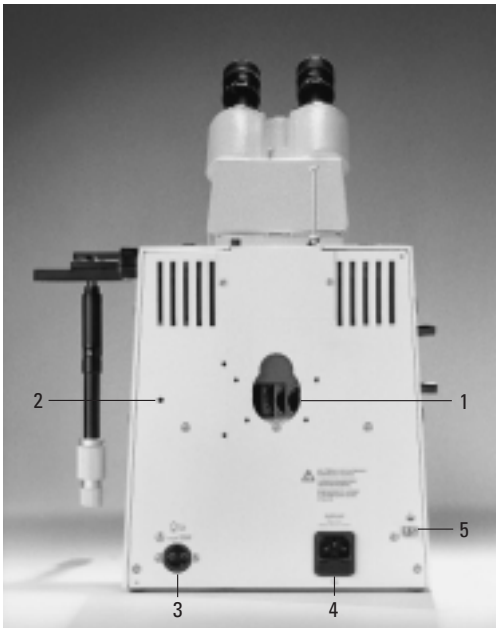



**Fig. 6** Back view of microscope
**1** Space for assembling a lamphousing or mirrorhousing, **2** Hole for guide pin, **3** Socket for lamp plug, **4** Mains socket, **5** Potential equalisation

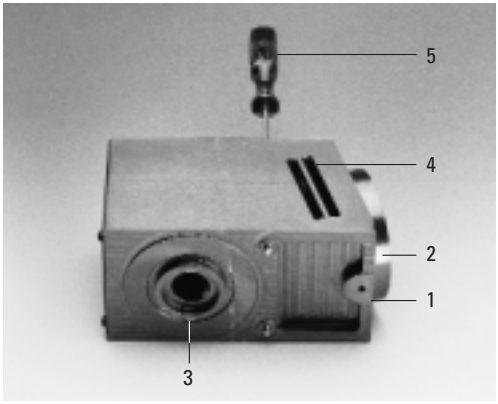



**Fig. 7** Lamp mount
**1** Guide pin, **2** Lateral lamphousing mount, **3** Ring screw for mounting to microscope, **4** 2 spaces for light filters, **5** Fixing screws (Allen screws)

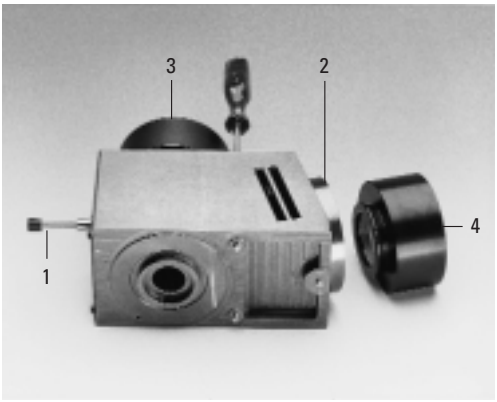



**Fig. 8** Mirror housing and illumination telescope
**1** Mirror switching lever, **2** Lateral lamphousing mount with fixing screw, **3** Back lamphousing mount with Allen screw, **4** Illumination telescope for gas discharge lamps

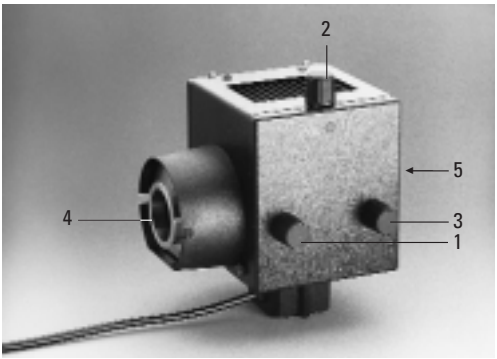



**Fig. 9** Lamphousing 106Z L
**1** Collector adjustment, **2** Vertical lamp adjustment, **3** Horizontal lamp adjustment, **4** Dovetail ring mount, **5** Reflector adjustment (not visible)

### 3.3 Assembling and exchanging the incident light lamps

**Exchanging the 12 V 100 W halogen lamp:**

Disconnect the lamp and lamphousing from the power supply.
Pull out the mains plug.

**Lamphousing 107L**

Slacken the fixing screw on the cover and lift off the cover (10a.4).
Move the collector (10a.2) to the front and pull the defect 12 V 100 W lamp out of the base towards the front (10b.1)

**Caution, hot surface!**

Without removing its protective cover, put a new lamp into the base, without tilting, as far as it will go.
n.b. Leave the protective cover on the lamp until it is in position.
Avoid making finger marks or wipe off immediately.
Close the lamphousing.

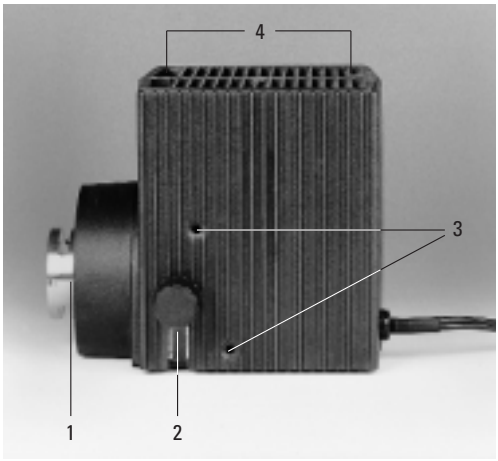



**Fig. 10a** Lamphousing 107 L
**1** Dovetail ring mount, **2** Collector adjustment, **3** Lamp adjustment, horizontal and vertical, **4** Cover fixing screws

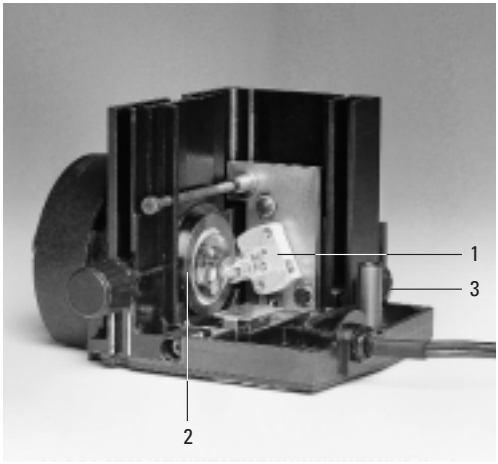



**Fig. 10b** Lamphousing 107 L, opened
**1** Mount with halogen lamp, **2** Collector, **3** Screw hole for cover

**Lamphousing 106Z L***

Slacken the fixing screw on the lid (11.4, 9).
Pull the cut-out plug slightly out of the socket (11.11) and flip up lid (11.1).
Move the collector to the front and lift the defect lamp out of the base (11.2, 11.3, 14.1).
For convenience, the lamp holder can be removed from the lamphousing as well. To do this, slacken the fixing screws on the lamp holder (11.10) and pull out the lamp holder (12).

**Caution, hot surface!**

Without removing its protective cover, put a new lamp into the base, without tilting, as far as it will go.
n.b. It is important to leave the protective cover on the lamp until it is in position.
Avoid making finger marks or wipe off immediately.
Close the lamphousing.

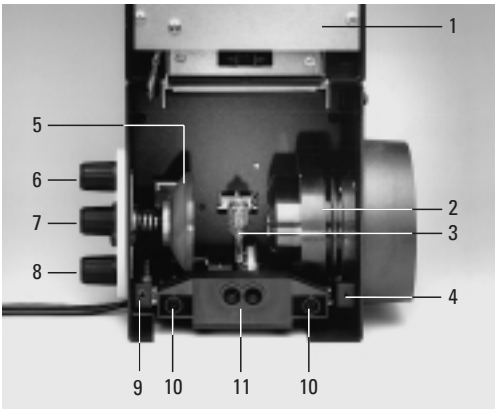



**Fig. 11** Lamphousing 106Z L
**1** Lid, flipped up, **2** Collector, **3** 12 V 100 W halogen lamp or gas discharge lamp in holder, **4, 9** Lid screw holes, **5** Reflector, **6, 8** Screws for x-y adjustment of reflector, **10** Screws for fixing the lamp holder, **11** Cut-out plug socket

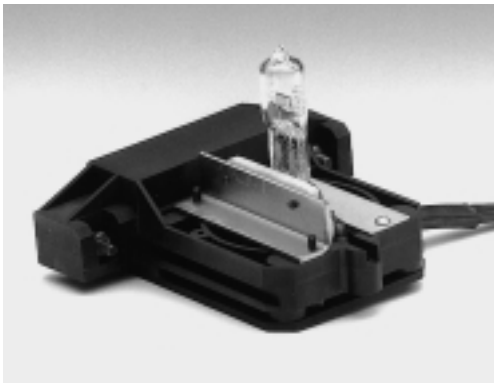


**Fig. 12** 12 V 100 W lamphousing with halogen lamp

### 3.3 Assembling and exchanging the incident light lamps

**Assembling and exchanging Hg and Xe lamps**

**Power units**

Hg and Xe lamps are powered by separate power units.
Please make sure to read the special manuals for these power units.

**Lamphousing 106Z L**

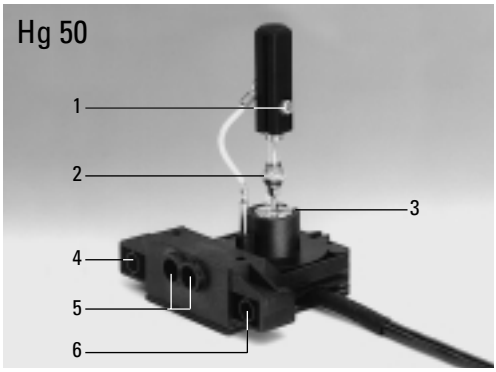
Besides the halogen lamp, the following gas discharge lamps can be used, which each require different lamp mounts (13) and power units:

| Type | | Average life span |
|---|---|---|
| Hg ultra high pressure lamp | 50 W (A.C.) | 100 h |
| Xe high pressure lamp | 75 W (D.C.) | 400 h |
| Hg ultra high pressure lamp | 100 W (D.C.) | 200 h |
| Hg ultra high pressure lamp | 100 W (D.C., type 103 W/2) | 300 h |

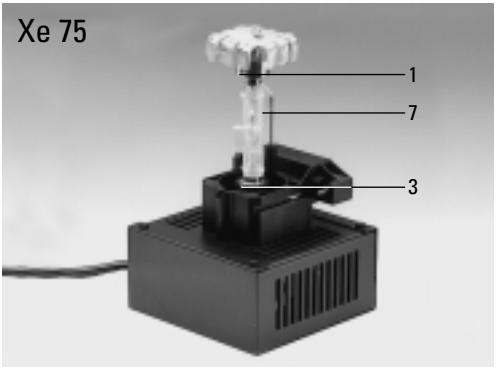
**n.b. It is extremely important to heed the following advice!**

Always disconnect the power unit from the mains before assembling the lamphousing 106Z.
Wait for the lamphousing to cool down for at least 15 minutes as otherwise it may explode.
Never touch glass parts of the burner with your bare hands as finger perspiration burns in.
Wipe off any finger perspiration and dirt with a clean cloth.
Adjust the lamps immediately after ignition (see page 53).
Never look directly into the light path (risk of glare)
Always wear the supplied gloves and face mask when assembling Xe burners (risk of explosion).

Avoid switching on and off frequently, as this greatly reduces the life of the lamp.
Hot Hg lamps do not ignite again until they have cooled down.
It is best to keep a record of the number of hours a lamp has been in use (hour counter in the power unit) and compare it with the manufacturer's specifications.
Spent burners become discoloured and should be exchanged before the specified life expectancy has expired.
Ensure that lamphousing is adequately ventilated. Never block the air vents with paper, etc (fire risk).
Dispose of spent burners in an environment-friendly way.







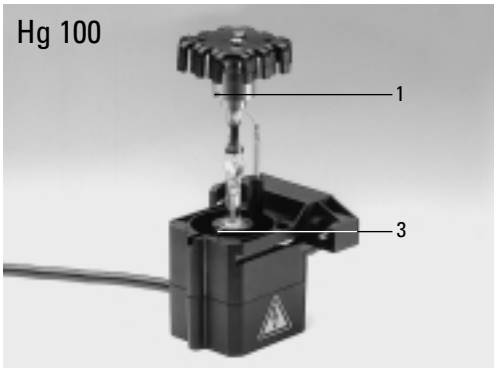




**Fig. 13** Lamp holders for gas discharge lamps
**1** Upper clamp, **2** Seal point of the burner, **3** Lower clamp, **4, 6** Drill holes for fixing the lamp holder, **5** Sockets for cut-out plug, **7** Protective cover

**n.b.!**

1. the lettering is **upright** after insertion (different diameters of the metal base for the Hg 100 and Xe 75 burners ensure that these are always inserted the right way up).

**n.b.!**

2. if the bulb has a seal point (13.2), the burner is turned so that this point will be **at the side,** not in the light path.

**n.b.!**

The Hg 50W lamp is correctly fitted when:
1. The type name stamp on the lower lamp base is visible. It must be readable, i.e. not upside down.
2. the upper base is labelled with the letters - UP -.

The LH 106Z L is opened by undoing the fixing screws on the lid (11.4, 9).
Pull the cut-out plug slightly out of its socket and flip up lid (11.11, 11.1)

Always insert the burner so that

Put the upper pin of the burner between the clamps of the flexible power supply and clamp with screw (13.1).
Unscrew the stud (13.3) in the holder slightly, insert the lower end of the metal base and retighten the stud.

Make sure that the lamp base and the power unit have the same number. If the lamp base is marked L1, for example, L1 must also be set on the power unit to make full use of the lamp and not to shorten its life.
Move the collector to the front position with the focusing knob (14.1).

**n.b.!**

Remove the protective covering from the burner (13.7).

Put the lamp holder with burner inserted into the lamphousing and secure with the screws (11.10).Try moving the collector (14.1): it must not touch the power lead. When closing the lamphousing, make sure that the pins of the cut-out plug engage in the sockets (11.11). Retighten the screws of the lid. Push the cut-out plug in as far as it will go.
Attach the lamphousing to the microscope and connect to the power unit (compare mains voltage!)

**n.b.!**

Adjust the burner **immediately** after ignition.

To exchange the collector on the lamphousing 106Z:
Move the collector (11.2) to the rearmost position with the focusing knob (14.1). Pull the focusing knob of the collector outwards (the lamp is not inserted) and remove the collector.

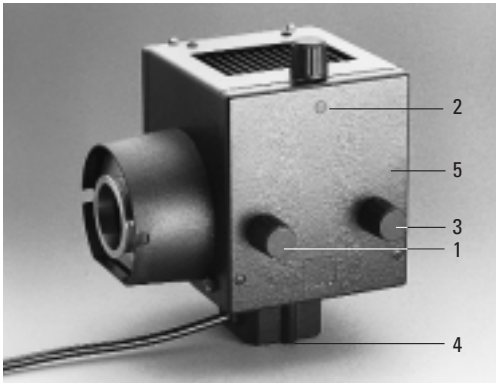



**Fig. 14** Lamphousing 106Z L with Hg 100 W lamp
**1** Collector focusing, **2** Lamp adjustment, vertical, **3** Lamp adjustment, horizontal, **4** Lamp holder Hg 100 W, **5** Reflector adjustment (not visible)

### 3.4 Assembling the 3-plate x/y stage no. 19

The 3-plate x/y stage no. 19, size 247 x 230 mm, adjustment range x-y 60 x 40 mm, is delivered in separate packaging and assembled as follows:

1. Screw the 3 Allen screws (15.2, 15.3) out of the stage support surfaces and wipe any remains of packaging or dust, etc. from the stage with a clean cloth.
2. Align the stage with the x-y drive (15.1) at the front right and lay it so that its undersurface rests on the stage support surfaces.
3. Align the drill holes in the stage over those in the support surface.
   If the drill holes are covered, please adjust the upper stage plate with the x-y stage drive.
4. Screw down the stage with Allen screws.

To assemble the square insert plate (16.1):

1. Insert the corner of the insert plate that is marked red (16.2) at an angle from above into the corner of the stage that is also marked red and is fitted with a spring (15.4).

   **n.b.:**

   Only press the spring at the side!
   Do not press the square insert plate (16.1) onto the spring from above, as the insert will not be aligned plane-parallel to the stage and can be bent.

2. Drill holes (17.2) for attaching small biological specimen clips (not part of delivery)

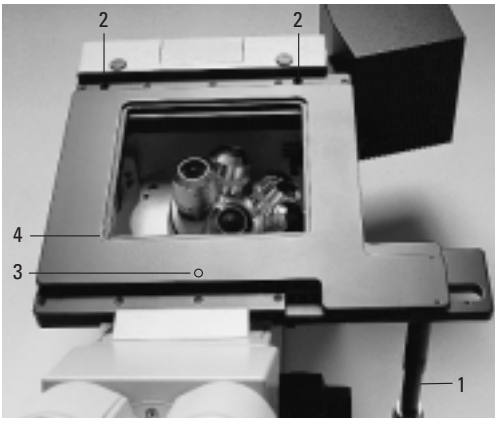



**Fig. 15** 3-plate x/y stage no. 19 without inserts
**1** Stage drive, **2** Rear fixing holes, **3** Front fixing hole (not visible, concealed by stage plate), **4** Corner with red dot and spring

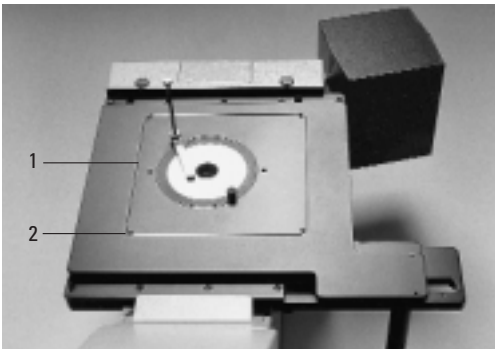



**Fig. 16** 3-plate x/y stage no. 19 with inserts
**1** Square insert plate, 150 x 150 mm, **2** Corner of the insert plate marked with red dot

3. Screw the large clip for metallographic samples into the M4 thread hole (17.4).
4. Allen screws (17.3) for plane-parallel alignment.

**n.b.:**

Do not adjust these Allen screws. They are only for adjustment in the factory.

5. Insert the round stage inserts with a steel ring, inner hole of 20 mm, 30 mm and 40 mm diameter (18.1) into the mount.
   The round stage inserts are equipped with a screw-in handle (18.2) to facilitate changing and rotating the inserts (rotation e.g. for orientation of a sample).
   Please handle the round stage inserts (18) with care. The thin inner steel rings (18.1) should not be subjected to any pressure or dropped.
   Rough treatment can cause deformation .

**Simple stage plate***

The simple stage plate (19) is assembled in exactly the same way.

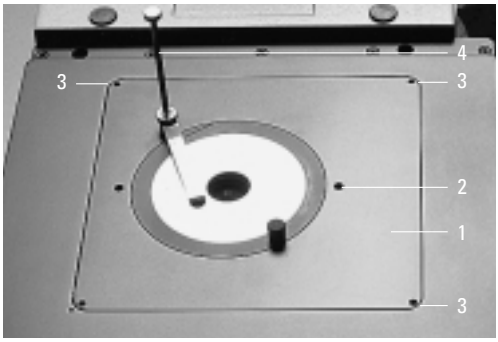



**Fig. 17** Stage inserts with accessories
**1** Square insert plate, 150 x 150 mm, **2** Drill holes for small specimen clips (not part of standard delivery), **3** Allen screws for plane-parallel alignment (for factory adjustment only), **4** Large specimen clamp for metallographic objects

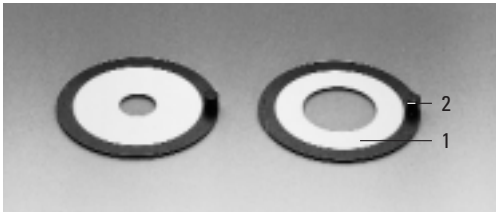



**Fig. 18** Round stage inserts
**1** Steel ring with inner hole of 20 mm, 30 mm, 40 mm, **2** Grip button, can be screwed off

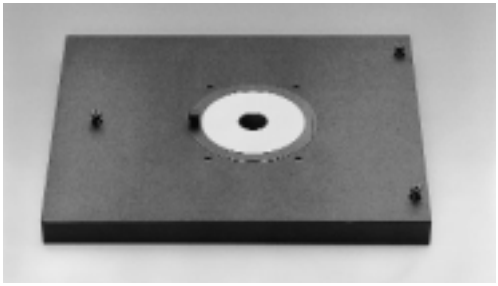


**Fig. 19** Simple stage plate

### 3.5 Assembling the tubes:

**HCI B 22**
Binocular tube with 45° viewing angle
Field of view index up to 22
Eyepiece diameter 30 mm for HC PLAN 10x/20 or 22 eyepieces
Interpupillary distance setting: 55–75 mm

**HCI 3T 22**
Trinocular tube, 45° viewing angle
Light path: 100 % vis
50 % - 50 %
100 % photo
Field of view index up to 22
Eyepiece diameter 30 mm for HC PLAN 10x/20 or 22 eyepieces
Interpupillary distance setting: 55–75 mm

**HCI BV 22**
Ergo binocular tube with 15°–50° viewing angle
Field of view index up to 22
Eyepiece diameter 30 mm for HC PLAN 10x/20 or 22 eyepieces
Interpupillary distance setting: 55–75 mm

Using a hexagonal screwdriver, slacken the clamp screw (20.1, 21.1, 22.1) on the side of the tube change mount on the stand and remove the black cap.
Mount the tube so that the guide pin snaps in position and the Siedentopf binocular element (20.3, 21.3, 22.3) points upwards as a V shape. Retighten the clamp screw. Hold on to the tube until the clamp screw is tightened as otherwise it might fall off.

Insert the eyepieces into the tube ports as far as the stops.
Insert the eyepiece with adjustable eyelens into the right-hand port, where it is easier to handle.

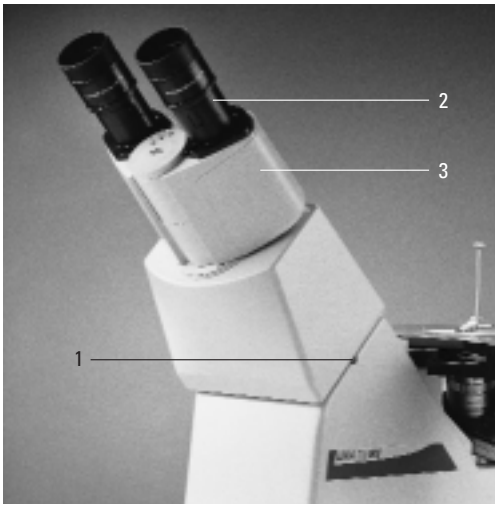



**Fig. 20** HCI B 22
**1** Clamp screw, **2** Tube port, **3** Siedentopf binocular element

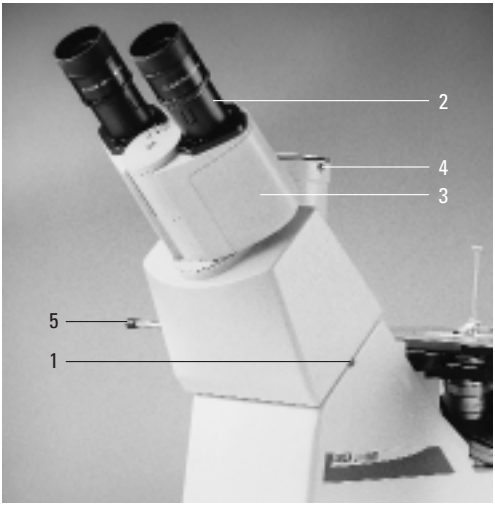



**Fig. 21** HCI 3T 22
**1** Clamp screw, **2** Tube port, **3** Siedentopf binocular element, **4** Photo/TV port, **5** Beamsplitter switch rod

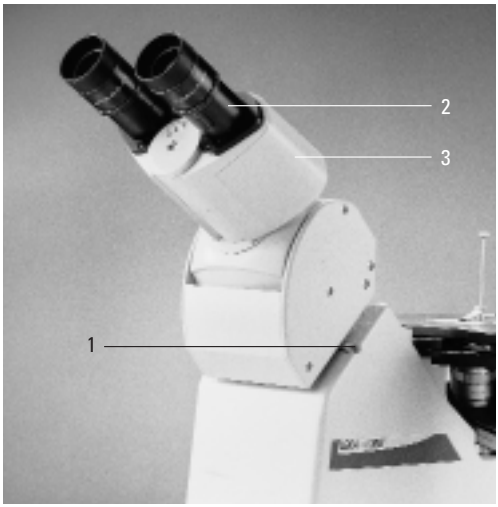



**Fig. 22** HCI BV 22
**1** Clamp screw, **2** Tube port, **3** Siedentopf binocular element

**Assembly of Leica DMR tubes:**

All the tubes in the Leica DMR range can be adapted with the IR HC tube adapter (23.3):
e.g.
Binocular observation and photo tube HC FSA 25 PE (23.1)
Viewing angle 30°
With side port for reflecting measurement scales and µ marks into the microscope image (slide overlay) and for connecting the MACRODUAL ZOOM device (see under Accessories, Slide Overlay and Macro device)
Field of view index up to 22.
Eyepiece diameter 30 mm for HL PLAN 10x/20 or 22 eyepieces
Eyepieces with larger field of view numbers are not recommended for use on the DM IRM.

The tube adapter IR HC is mounted on the tube change mount of the stand and stabilised by tightening the clamp screw (23.4).
n.b.: Hold on to the tube adapter until the clamp screw is tightened.
Then insert the HC FSA 25 PE tube in the change mount of the tube adapter and fasten with clamp screw (23.5).

The following tubes from the Leica DMR range are also adaptable:

Bino HC BSA 25 (24.1)
Trino HC FSA 25 P and PR (24.2)
(P + PR = with and without back reflection)

Photo port for 1 photo/TV connection (25.2)
Photo port for 2 photo/TV connections (25.1)
Switchable 100 %/100 % (25.3)

All Leica DMR trinocular tubes have the following beamsplitting system:
100 % vis., 100 % photo or 50 %/50 %.

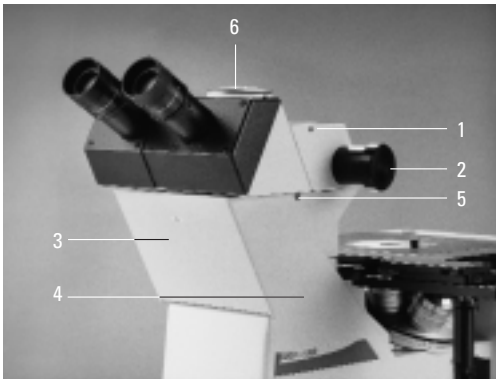



**Fig. 23** Tubes from the DMR range
**1** HC FSA 25 PE, **2** Side port for optical overlay, **3** Tube adapter IR HC, **4** Clamp screw for stand/adapter interface, **5** Clamp screw for adapter/tube interface, **6** Photo/TV port

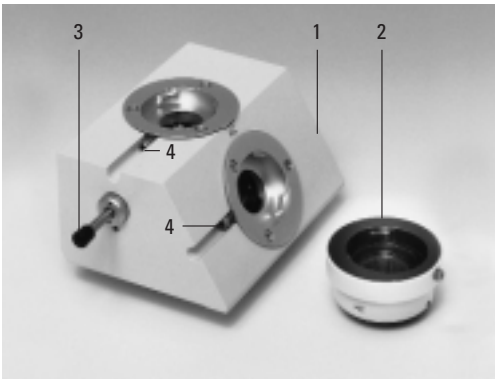



**Fig. 25** Photo adapter tube
**1** Photo adapter tube, 2 exits, **2** Photo adapter tube, 1 exit. **3** 100 %/100 % switch rod, **4** Clamp screw

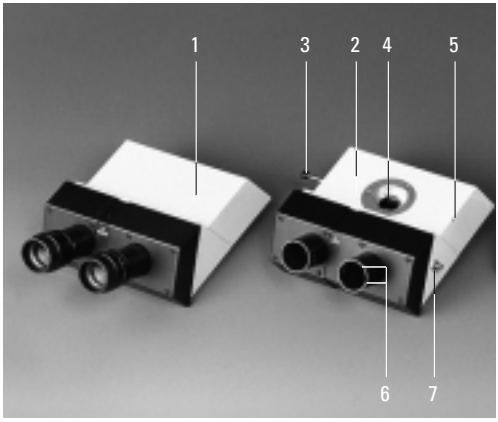



**Fig. 24** Leica DMR HC tubes
**1** HC BSA 25, **2** HC FSA 25 P + PR, **3** Beamsplitter switch rod, **4** Mount for photo adapter tube, **5** Clamp for photo adapter tube, **6** Clickstop position for Pol eyepieces, **7** Socket for control cable (PR tube only)

### 3.6 Inserting the objectives

Lift the square insert plate out of the 3-plate x/y stage (26)

BD objectives (bright- and darkfield) are screwed straight into the holes with M32 x 0.75 mm thread in the objective nosepiece (26.1). They are arranged clockwise from the lowest to the highest magnification.
Spacer rings 32/25 or 32/RMS (27) are needed for inserting objectives with M25x/0.75 mm or RMS screw thread.

Please make sure that the objective magnification matches the corresponding standard magnification engraved in the front of the nosepiece.
e.g. objective 5 x with standard magnification 50 (26.2).

Unoccupied nosepiece positions must be closed with the supplied screw caps to protect the inner optics from dust.

! **n.b.:**

Please note that the fact that the front lenses of the objectives point upwards means that they are exposed to more contamination than objectives of upright microscopes.
Therefore, check frequently to make sure they are clean (see section 7, Care and Maintenance).

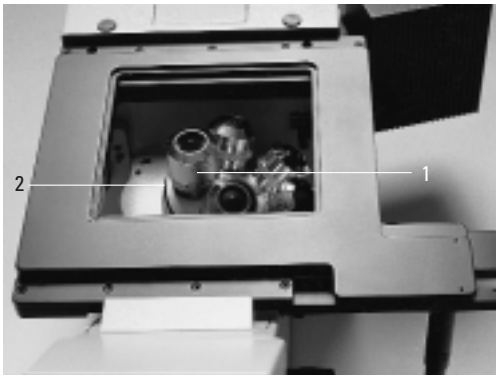



**Fig. 26** Inserting the objectives
**1** Objective nosepiece with M32 x 0.75 mm objective thread,
**2** Standard magnification engraving

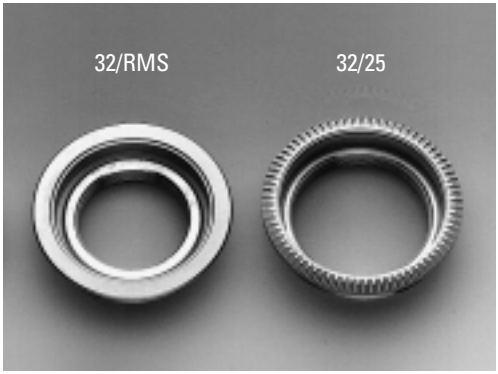



**Fig. 27** Spacer rings

### 3.7 Inserting the reflectors and fluorescence filter systems*

Remove the front cover after slackening the Allen screws.
Insert the reflectors into the dovetail mount as far as the stop, with the flattened end of the reflector first and the engraving underneath.
Up to 3 reflector positions can be used by rotating the turret plate.

**n.b.:**

Do not touch the optic components of the reflectors!
Before screwing the front cover back on, rotate the turret plate carefully to check the smooth rotation of the reflectors.

**BF reflector (29)**

With neutral plane glass beamsplitter for brightfield, polarisation contrast and interference contrast

Neutral density filter N16 for BF reflector (29.2) (option)

The neutral density filter N16 can be inserted in the ring mount of the BF reflector, holding the filter by the protruding mount.

The neutral density filter is used to avoid damage to the eyes caused by high light intensity when changing between bright- and darkfield.
It is not to be recommended for observing dark objects or for polarisation or interference contrast.
Nor is it necessary for purely brightfield configurations without darkfield.

**Other reflectors:**

**DF reflector (30)***

Mirror with centre stop for darkfield observation only

**Smith reflector (31)***

With neutral plane glass beamsplitter 22.5° and full mirror 22.5° plus compensator lens for brightfield, quantitative polarisation and interference contrast.

**ICR reflector (32)***

with permanently assembled crossed polarisers and MgF2 plate for fast switching to interference contrast without using the polariser/analyser slide.
n.b.: Colour interference contrast is only possible by adjusting the prisms.
Fluorescence filter systems (filter cubes)
Combination of excitation filter, dichromatic beamsplitter and suppression filter for wavelength-specific excitation and imaging of fluorescing materials or dyes.

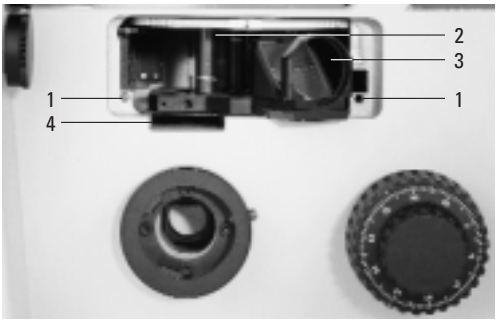



**Fig. 28** Inserting the reflectors
**1** Screw holes for front cover, **2** Reflector turret, **3** Reflector BF inserted in dovetail mount, **4** Analyser slot


**Fig. 29** BF reflector
**1** Neutral plane glass beamsplitter, **2** N16 neutral density filter

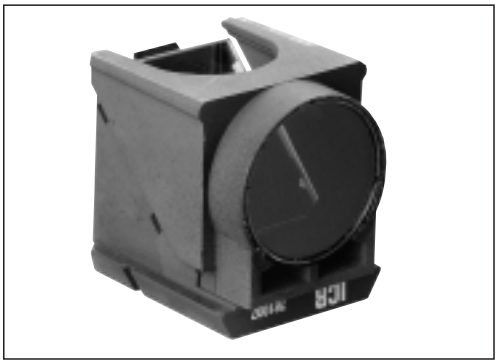


**Fig. 32** ICR reflector

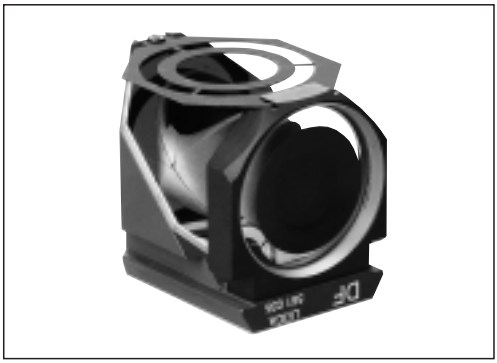


**Fig. 30** DF reflector

**Fig. 31** Smith reflector

### 3.8 Inserting the ICR prism disc and the ICR objective prisms

The ICR prism disc with the ICR prisms you ordered are already assembled in the microscope at the factory.
In case you want to retrofit the ICR prism disc, please proceed as follows:
Remove the front cover under the objective nosepiece (34.2) after slackening the Allen screws.
Insert the ICR prism disc (34.1) in the mount and tighten with the two screws. n.b.: insert the prism disc with the prism mount pointing downwards.

**Retrofitting individual ICR prisms:**

Please align prisms against the stop pin (35.4) and only screw down lightly to avoid strain. Insert the prisms so that the code letter, e.g. A. points upwards and is readable.
Label the position of the prism on the outside of the ICR prism disc with label plates (34.5 )

Prism A – for objectives N PLAN 5x, 10x

Prisms D and D1 – both for objectives N PLAN 20x, 50x, 100x and HC PL FLUOTAR 5x–100x

**Differences between prism D and D1**

Prism D is the standard prism with greater shearing and therefore higher detection sensitivity for minute topological and refractive index variations in the specimen.
Prism D1 has smaller shearing than prism D and a lower detection sensitivity for topological and refractive index variations.
However, prism D1 is better at resolving details of fine specimen structures.


**Fig. 33** Assembly of ICR prism disc
**1** Objective nosepiece, **2** Mount for ICR prism disc

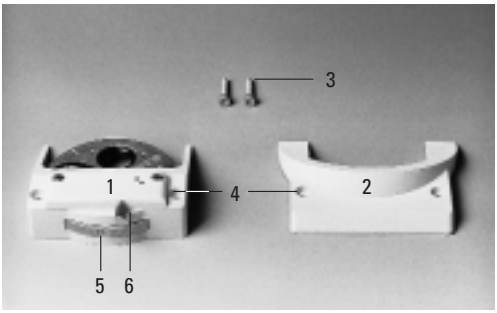



**Fig. 34** Assembly of ICR prism disc
**1** ICR prism disc, **2** Front cover under objective nosepiece, **3** Fixing screws, **4** Hole for fixing screws, **5** Label plates, **6** Knurled knob for contrast setting

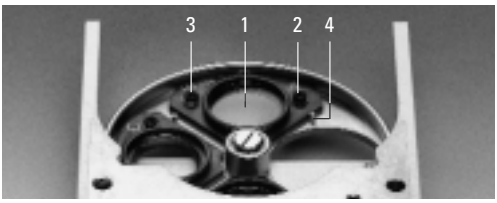



**Fig. 35** ICR prism disc
**1** ICR objective prism in mount, **2** Code letter (e.g. A), **3** Fixing screw, **4** Stop pin

## 3.9 Inserting the incident light polarisers and analysers

**Incident light polariser R/P in slide (36)**
Vibration direction of polariser is variable by slotting the polariser at different positions:
0° = east-west
45° = diagonal position
90° = north-south

The DMIRM uses the vibration position 0° = east-west.
Pull the polariser mount (36.1) out of the slide and slot it at the corresponding clickstop position.
Together with the IRM ICR/P analyser with 90° = north-south, the polarisation device is in the crossed position.

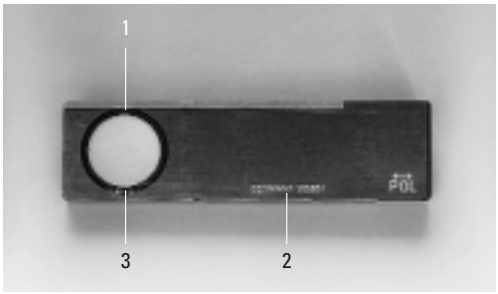



**Fig. 36** Incident light polariser R/P in slide
**1** Polariser mount, can be pulled out, **2** Polariser slide, **3** Clickstop positions 0°, 45°, 90° on back

**Other incident light polarisers in slide:**

**Incident light polariser, 90° rotatable with rotatable whole-wave compensator (37)**
The 0° = east-west vibration direction is intended for use on the DM IRM.
Preselect the vibration direction 0° = east-west on the dial (37.2).
Together with analyser IRM ICR/P 90° = north-south, the polariser and analyser are in the crossed position.

Polarisation-optic colour contrast is produced with crossed polarisers and by rotating the whole-wave compensator with the knurled knob (37.3).

The whole-wave compensator has a rotation range of 14° and is particularly advantageous for variable colour contrasting of anisotropic metal surfaces.

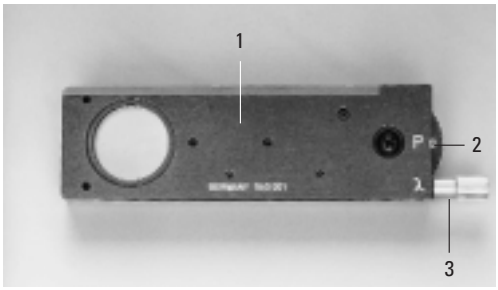



**Fig. 37** Incident light polariser, 90° rotatable with rotatable whole-wave compensator
**1** Polariser slide, **2** Dial for setting polariser, **3** Knurled button for rotating the whole-wave compensator

**Incident light polariser L ICR/P, with whole-wave compensator, reversible by 180° (38)**

For use on the DMIRM with fixed vibration direction 0° = east-west.
The whole-wave compensator is fixed in the 45° diagonal position and can be activated or deactivated by turning the polariser slide over by 180°. The polariser slide has bevelled edges on each side for turning (38.2).
When the whole-wave compensator is activated, an interference colour contrast with a fixed retardation of one wavelength (1st order red) is produced.

The polariser L ICR/P is also used for incident light interference contrast in grey and colour steps.

Insert the polariser slide into the polariser slot (2.13) so that the engraving faces you. The polariser slides have 2 notches which ensure the correct position in the light path (in or out).

n.b. If using high-intensity gas discharge lamps, e.g. Xe 75 W, always insert a Pol protection filter 504079 in the lamphousing (39.1) to prevent destruction of the polariser foil.

**IRM ICR/P analyser (40)**

For polarisation contrast and interference contrast.
Vibration direction 90° north-south rotatable by +/- 9° with adjustment knob (40.1).
In combination with one of the above-mentioned polarisers, the polarisation device is at a crossed position.
Insert the analyser into the analyser slot with the lettering upwards (1.18, 28.4). The analyser slide has two notches for positioning in the light path (in or out) (40.2).

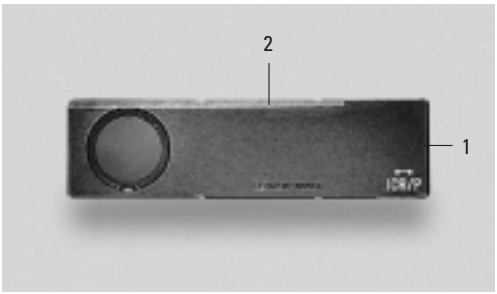



**Fig. 38** Incident light polariser L ICR/P with whole-wave compensator
**1** Polariser slide, **2** Bevelled edges on both sides

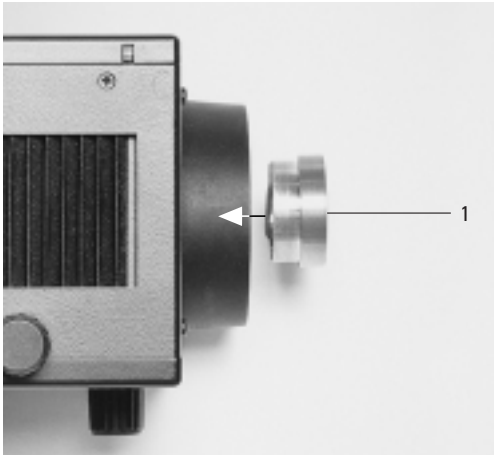



**Fig. 39** Inserting the Pol protection filter
**1** Pol protection filter

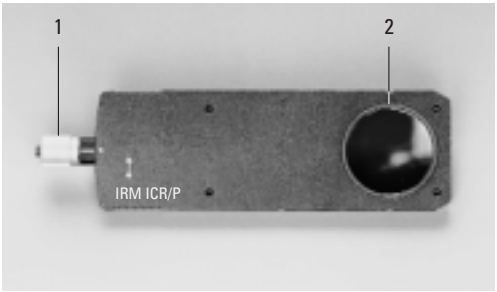



**Fig. 40** IRM ICR/P analyser
**1** Rotation adjustment knob, **2** Positioning notches

### 3.10 Assembly of the transmitted light illumination column and the condensers*

Slacken the 2 recessed head screws (41.2). Remove the cover (41.1) from the back of the stand.

Wipe the mount surface (42.3) with a dry cloth. Tilt the transmitted light illumination column (42.1) slightly to the back and insert it so that the stud (42.2) engages in the groove of the mount surface (42.4). Erect the TL illumination column and fix in position with the 4 screws (43.1)
Do not hold on to the TL illumination column when screwing it down, so that optimal alignment to the optical axis is guaranteed.

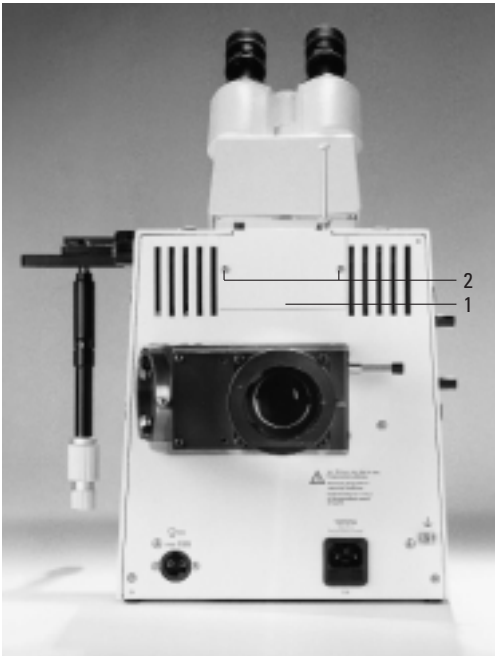



**Fig. 41** Back view of microscope
**1** Cover, **2** Recessed head screws

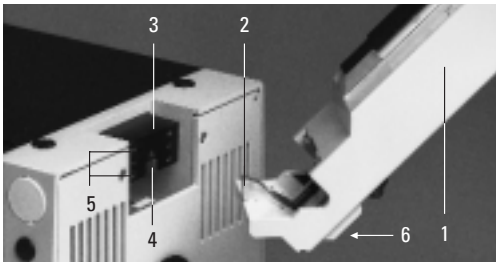



**Fig. 42** Assembly of transmitted light illumination column
**1** Transmitted light illumination column, **2** Stud of TL illumination column, **3** Mounting surface, **4** Groove of mounting surface, **5** Holes for fixing screws, **6** Knurled screw for clamping the illumination column (not assembled)

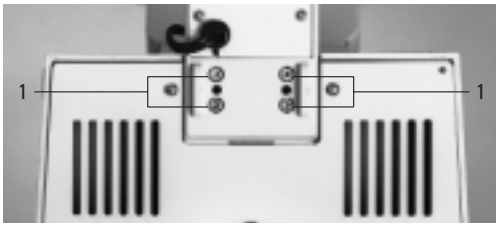



**Fig. 43** Back view of microscope
**1** Fixing screws for transmitted light illumination column

Lamphousing for transmitted light illumination (44)
for 12 V 100 W halogen lamps with single-lens aspherical collector and heat protection filter is an integral part of the transmitted light illumination column.

**Assembling and changing the 12 V 100 W halogen lamp**

Disconnect from the power supply.
Slacken the fastening screws (44.2) and remove the lamphousing casing (44.1).
Carefully remove the defect lamp from the pin base.
Insert a new 12 V 100 W lamp, still in its protective cover, into the pin base (45.1) as far as the stop.
n.b.: Leave the lamp's protective cover on until it is fully inserted.
Avoid making fingerprints or wipe off immediately.
Close the lamphousing again and fix in position.

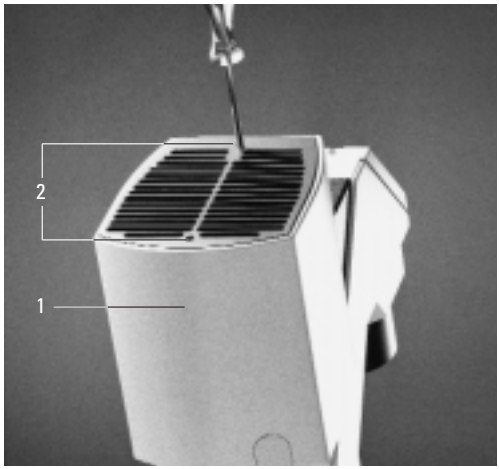



**Fig. 44** Lamphousing for transmitted light illumination
**1** Cover, **2** Cover fixing screws

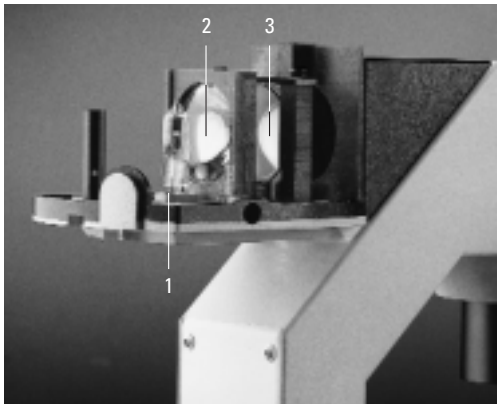



**Fig. 45** Lamphousing for transmitted light, cover removed
**1** Lamp holder (pin base) with 12 V 100 W halogen lamp, **2** Collector, **3** Heat protection filter

Condenser range:
See Leica DMIRB manual

**Assembling the 0.30 S70 condenser***

Tilt the TL illumination column to the back (46.1). Insert the 0.30 S70 condenser (46.4), with the top pointing towards the microscope stage, into the dovetail guide of the illumination column (46.2) from below. Adjust the condenser height until the upper edge of the condenser coincides with the condenser height marking (S70 on the illumination column) (47.1). Secure the condenser with the supplied hexagonal screwdriver (Fig. 47). Pull the TL illumination column back into an upright position.

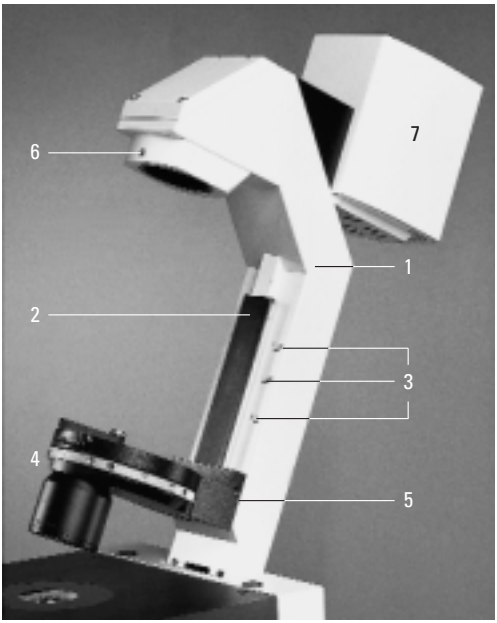



**Fig. 46** Assembly of 0.30 S70 condenser
**1** Transmitted light illumination column (tilted), **2** Dovetail guide, **3** Condenser height markings S1, S23 and S70, **4** 0.30 S70 condenser, **5** Condenser clamp screw, **6** Field diaphragm clamp screw, **7** Transmitted light lamphousing

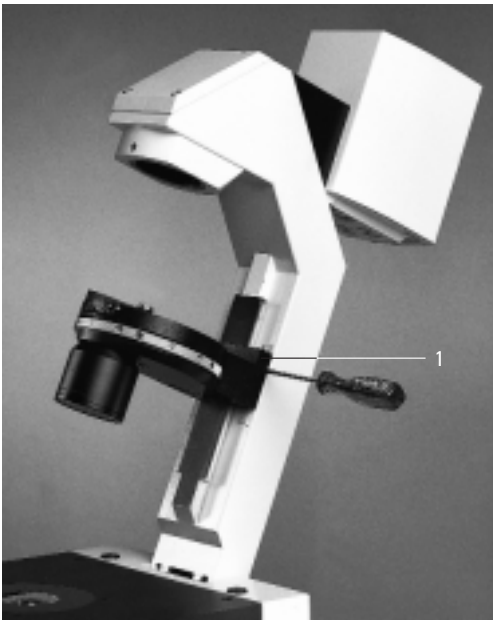



**Fig. 47** Assembly of 0.30 S70 condenser
**1** 0.30 S70 condenser in working position (upper edge of condenser coincides with condenser height marking S70)

**Assembling the 0.53 S23 and 0.90 S1 condensers***

With the illumination column tilted to the back, insert the condenser holder (48.4) into the dovetail guide of the illumination column from below (48.2). The condenser height adjustment should point to the left. Adjust the height of the condenser holder until its upper edge coincides with the condenser height marking S23 or S1 on the illumination column (48.1), depending on the condenser top used. Secure the condenser holder with a hexagonal screwdriver and clamp screw (48.5). Mount the base part of the condenser with the dovetail guide (49.1) to the slide change mechanism (49.2) of the condenser holder (Fig. 49). The condenser top should point downwards and the aperture diaphragm control towards the front (49.3). Slacken the clamp screw (49.5) and

push the condenser back as far as the stop. Retighten the clamp screw (49.5) slightly.

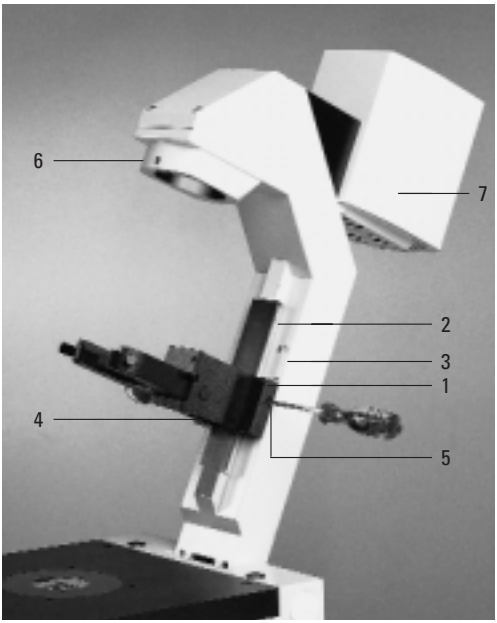



**Fig. 48** Assembly of condenser holder
**1** Condenser holder in working position for condenser 0.53 S23 (upper edge of condenser holder coincides with condenser height marking S23), **2** Dovetail guide, **3** Condenser height markings S1, S23 and S70, **4** Condenser holder, **5** Clamp screw for securing the condenser holder, **6** Clamp screw for field diaphragm module, **7** Transmitted light lamphousing

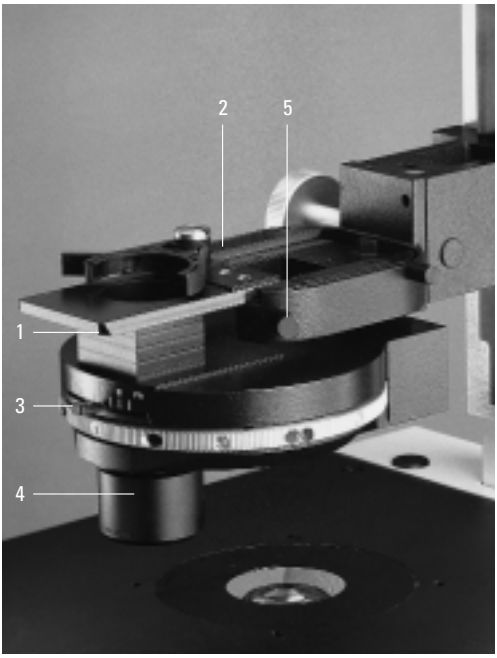



**Fig. 49** Assembly of 0.53 S23 condenser
**1** Dovetail guide of the condenser, **2** Slide changer of condenser, **3** Aperture diaphragm adjustment, **4** Condenser top 0.53 S23, **5** Condenser clamp screw

**Assembly of field diaphragm ***

To enable Koehler illumination when using condensers 0.53 S23 and 0.90 S1, a field diaphragm has to be assembled. Insert the field diaphragm module (50.1) into the mount (Fig. 50) from below. The diaphragm adjustment (50.2) should point in the direction of the tube. Secure with clamp screw (50.3).

**Assembly of filters and filter holder**

The Leica DM IRM is equipped with a holder with spaces for 3 filters with 40 mm diameter.
The filters are already fitted into the holder at the factory. If you are retrofitting filters yourself, assemble as follows:

– Slacken the clamp screws (Fig. 51.1) and remove the filter holder.
– Put the filters into the holder (Fig. 52).
– Mount the filter holder onto the transmitted light illumination column and secure in position with the clamp screws.

Connect the TL illumination to the integrated power supply via the socket (3.2). Then connect the microscope to the appliance cable (3.4) and connect to the mains.

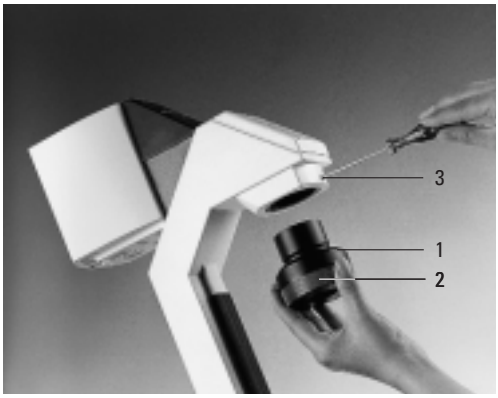



**Fig. 50** Assembly of field diaphragm
**1** Field diaphragm module, **2** Field diaphragm adjustment, **3** Clamp screw for securing the field diaphragm module

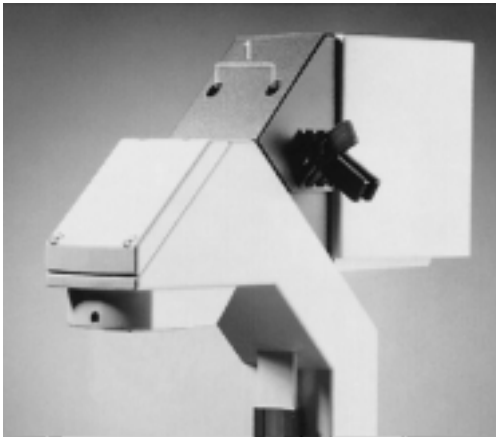



**Fig. 51** Assembly of filters
**1** Clamp screws for securing the filter holder

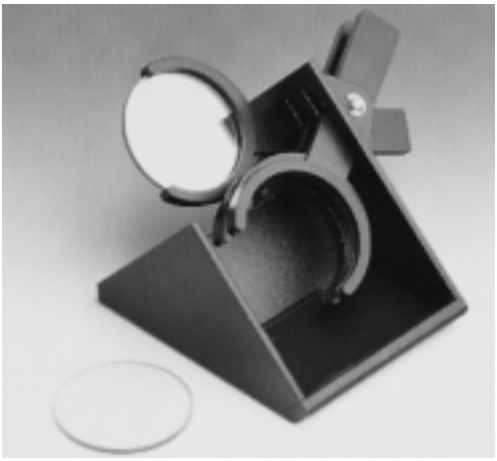


**Fig. 52** Assembly of the filter holder for 3 filters

# 4 Start-up and operation

### 4.1 Coaxial coarse and fine focusing

The coarse drive (53.1) and the fine drive (53.2) act on the objective nosepiece and the objectives.
The sample is focused by raising or lowering the objective nosepiece and the objective that is currently in the light path.

The position of the stage remains unchanged, making it extremely stable and suitable for heavy samples.

The total vertical travel of the coarse and fine focusing is 7 mm, from 2 mm below to 5 mm above the stage surface.

One drum interval of the fine focus corresponds to a vertical movement of approx. 2 mm of the objective nosepiece (53.2).

When focusing the specimens and altering the x/y position, please take extra care when using high-magnification objectives!
When objectives with high magnifications and short working distances (from 50 x upwards) are used, the specimen and the stage insert may easily be raised and tilted.
When the specimen is scanned, the front lens of the objective may then knock against the edge of the stage insert.

**n.b.!**

Before rotating the nosepiece and changing objectives of 50 x–250 x magnification, lower the coarse and fine focus drive if possible, to avoid contact between the front lens and the stage insert.

**n.b.!**

Caution with special objectives PL FLUOTAR 100 x OIL, PL APO 100 x, 150 x, 250 x!
With these objectives, the front lens and the stage insert come into contact as soon as the objective is moved over the edge of the inner hole of the stage insert (Fig. 54.1).

**n.b.!**

Caution with stage insert with 40 mm inner hole!
When using high-magnification darkfield objectives above 50 x, only about 38 mm of the inner hole can be used as the annular mirror lifts the stage insert at the edge.

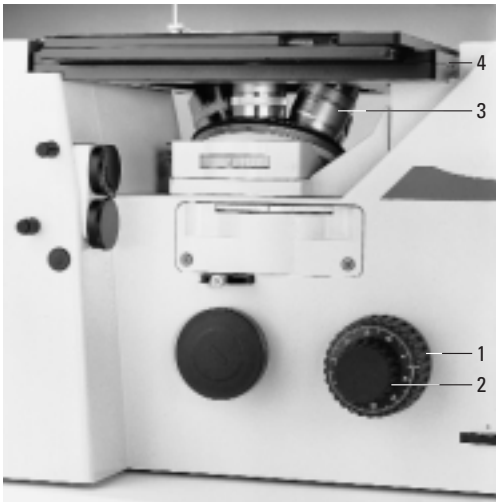



**Fig. 53** Side view of the microscope
**1** Coarse drive, **2** Fine drive with scale division, **3** Objective nosepiece with nosepiece focusing, **4** Specimen stages with 3-point support

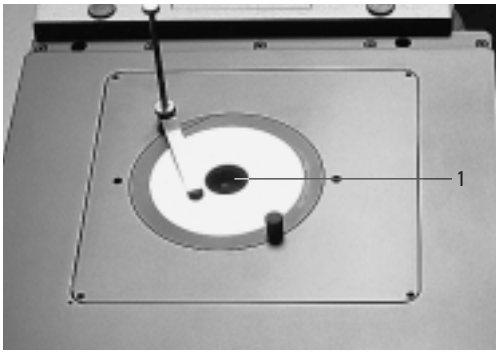



**Fig. 54** Specimen stage with inserts
**1** Inner hole of the stage insert

### 4.2 Observation tubes

**Fig. 55**
HCI B 22
Binocular tube
45° viewing angle
Field of view index up to 22
Eyepiece diameter 30 mm for HC PLAN 10x/20 or 22 eyepieces
Interpupillary distance setting: 55–75 mm

**Fig. 22** (see p. 22)
HCI BV 22
Ergonomic binocular tube
15°–50° viewing angle
Field of view index up to 22
Eyepiece diameter 30 mm for HC PLAN 10x/20 or 22 eyepieces
Interpupillary distance setting: 55–75 mm

**Fig. 56**
HCI 3T 22
Trinocular tube, 45° viewing angle
Light path: 100 % vis – switching rod
50 %-50 % – switching rod
100 % photo – switching rod
Field of view index up to 22
Eyepiece diameter 30 mm for HC PLAN 10x/20 or 22 eyepieces
Interpupillary distance setting: 55–75 mm

For trinocular tubes HCI 3T 22 the light path is preselected with the switching rod at the side (56.2).

See chapter 5.1, Accessories on how to operate trinocular tubes HC FSA 25 PE

**Setting the interpupillary distance:**

The binocular tubes have to be adjusted to the individual interpupillary distance of the user.

This is done by pulling the eyepiece tubes apart or pushing them together with both hands until the two part images in the microscope superimpose.
Only one single, circular, clear image is seen.

**Compensation of defective eyesight**

For viewers with normal eyesight and those wearing eyeglasses, the eyelenses of the eyepieces are adjusted to the normal position.
The normal position of the eyepiece eyelenses is indicated by a light-coloured engraving encompassing the base part of the eyepiece.
Viewers with defective eyesight should first look through the left eyepiece with their left eye and focus the specimen with the fine drive. Then they should look at the same area of the specimen with their right eye and rotate the eyelens of the right-hand eyepiece (without adjusting the fine drive) until a sharply focused image is obtained.
For eyepieces with inserted graticule, first focus the eyepiece on the graticule, removing the specimen from the light path or bringing it greatly out of focus. Focus the graticule by adjusting the eyelens (make sure your eye is relaxed; this is best done by looking out the window at a distant object for a moment).
After this, only focus the specimen through the eyepiece with graticule. With your other eye, focus the eyepiece without graticule with the eyelens of this eyepiece.

! **n.b.:**

If you are wearing eyeglasses, push back the anti-glare protection of the eyepieces (push-back eyecups, 55.3).

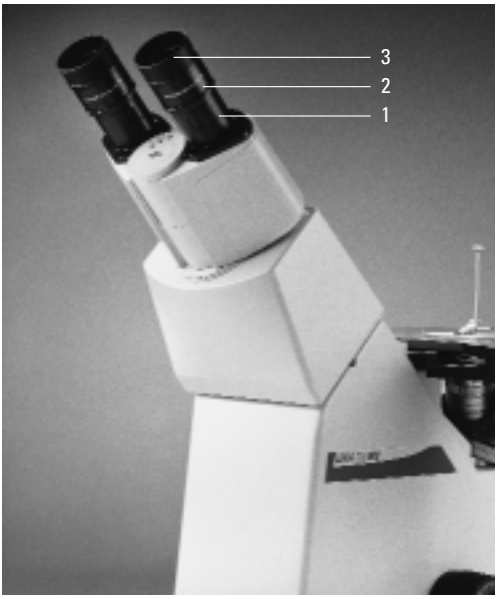



**Fig. 55** Binocular tube HCI B 22
**1** Eyepiece tubes, **2** Eyepieces, **3** Anti-glare protection (push-back eyecups)

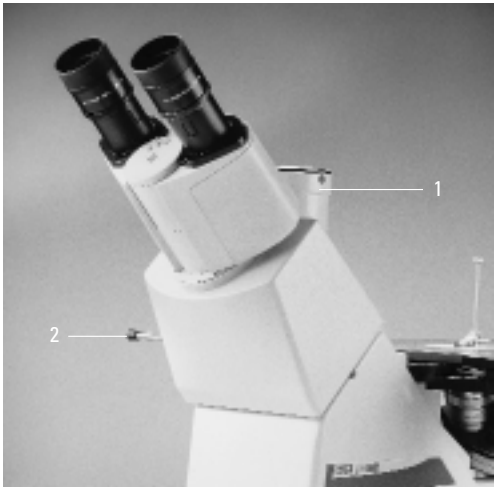



**Fig. 56** Trinocular tube HCI 3T 22
**1** Photo/TV exit, **2** Switch rod for light path

### 4.3 Tube module 1x, magnification changer 1 x, 1.5 x or 1 x, 1.5 x Bertrand lens

Our product range includes 3 tube lens systems which are effective at all the light exits of the microscope.

**Tube module HC oo/1 x**

This results in fixed standard magnifications in connection with objective, eyepiece or TV adapter. e.g. Mobjective 10 x Meyepiece 10 x Mtube factor 1 x = total magnification 100x

**Tube module oo/1 x, 1.5 x (magnification changer)***

The objective magnification can be increased by 1.5x by turning the wheel (57.1).
This is a particular advantage for highlighting specimen details or for obtaining the standard magnification 1500 x with 100 x objectives.
Please note that due to the additional magnification factor of 1.5 x the size of the object field is reduced in proportion.

**Tube module oo/1 x, 1.5 x, Bertrand lens***

By turning the wheel (58.1) it is either possible to engage the Bertrand lens or to focus with the focusing lever (58.2).
With the Bertrand lens the back focal plane of the objective can be observed and used for the following functions:

1. Lamp centration
2. Centration of the aperture diaphragm
3. Observation of the isogyre cross for transmitted light polarisation and interference contrast
4. Superposition of light and phase rings for transmitted light phase contrast
5. Auxiliary lens for low magnifications in transmitted and incident light.

After the Bertrand lens has been engaged, the focusing lever (58.2) can be operated to focus and/or centre the image of the lamp filament or aperture diaphragm, isogyre cross, phase rings, specimen.

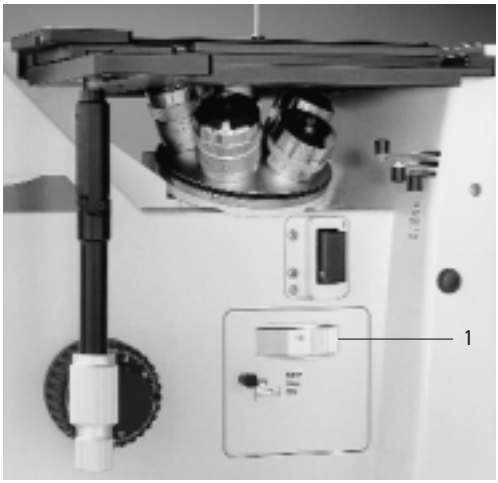



**Fig. 57** Side view of the microscope
**1** Dial for adjusting tube lens 1 x/1.5 x

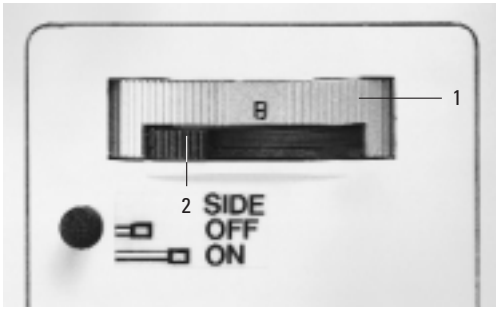



**Fig. 58** Side view of the microscope
**1** Dial for adjusting tube lens 1 x/1.5 x, Bertrand lens, **2** Lever for focusing the Bertrand lens

### 4.4 Lateral photo/TV exit

There are 2 alternative configurations for the lateral photo/TV exit (1.12).
Either configuration with light path 100 % visual or 20 % visual/80 % side exit
or configuration with light path 100 % visual or 100 % side exit

Position of switching rod (59.1), pulled out
= side exit switched on
80 % or 100 % light

Position of switching rod, (59.1) pushed in
= side exit switched off
0 % light


**Fig. 59** Side view of microscope
**1** Switch lever for side port

## 4.5 Optical outfits

For metallographic examinations, objectives are used which have been optimised for incident light specimens without a coverglass (coverglass thickness 0) and incident light techniques.

These objectives can be equally used for transmitted light microscopy provided the transmitted light specimens are not covered with a coverglass.
Objectives with low magnifications and numerical apertures under 0.25 can also be used for transmitted light specimens with a coverglass without loss of image information.


**Fig. 60** Optical equipment
**1** HC PL FLUOTAR BD objective series, M 32 x/0.75 screw thread, **2** HC PLAN 10x/20 and M eyepieces, HC PLAN 10x/22 and M eyepieces

Please note the lettering on the objective:

Objective lettering:

| | | | | | | |
|---|---|---|---|---|---|---|
| N-PLAN | 10 x | 0.25 | | ∞ | -* | A |
| HC PL FLUOTAR | 50 x | 0.80 | BD | ∞ | 0 | D |
| Correction class | Reproduction ratio | Numerical aperture | Bright- and dark-field objective | Infinity corrected | Coverglass corrected | ICR-prism type |

Eyepiece lettering:

10 x = magnification
/20 = field of view (mm)
M = adjustable eyelens
= for eyeglass wearers (anti-glare protection removable or eyecups can be pushed back)

* - = designed for specimens with or without a coverglass
0 = designed for specimens without a coverglass


**Fig. 61** Optical equipment
**1** N PLAN objective series for brightfield, M25x/0.75 screw thread, **2** HC PLAN 10x/20 and M eyepieces, HC PLAN 10x/22 and M eyepieces

The DM IRM microscope is based on tube length ∞ (infinity) and a reference focal length of the tube lens of f = 200 mm.

Only infinity corrected Leica objectives may be used.

Earlier-type infinity Leica objectives can only be used if they are brightfield objectives and combined with the spacer ring 32/RMS.
Depending on the year the objective was made, the engraved magnifications may deviate by the factor 0.8 x, as the new DM IRM is designed for a reference focal length of the tube lens of 200 mm instead of the previous 250 mm (METALLOPLAN, MM6).

**Objectives for incident light brightfield, polarisation contrast, interference contrast ***

n.b.: Brightfield objectives with M25 x 0.75 mm or RMS screw thread need a spacer for adaption to the objective nosepiece with M32 x 0.75 mm thread (27)

| | | | | |
|---|---|---|---|---|
| with N PLAN objectives with M25 x 0.75 screw thread | | | | |
| N PLAN | 2.5 x/0.07 | ∞/- | FWD* 11.20 mm | Order no. 506083 |
| N PLAN | 5 x/0.12 | ∞/-/A | FWD* 14.00 mm | Order no. 506087 |
| N PLAN | 10 x/0.25 | ∞/-/A | FWD* 5.80 mm | Order no. 506084 |
| N PLAN | 20 x/0.40 | ∞/0/D | FWD* 1.10 mm | Order no. 566026 |
| N PLAN | 50 x/0.75 | ∞/0/D | FWD* 0.37 mm | Order no. 566027 |
| N PLAN | 100 x/0.90 | ∞/0/D | FWD* 0.27 mm | Order no. 566028 |
| Spacer ring 32/25 | 6 x | | | Order no. 561003 |
| with PL FLUOTAR objectives with M25 x/0.75 screw thread | | | | |
| PL FLUOTAR | 1.6 x/0.05 | ∞/- | FWD* 1.54 mm | Order no. 566010 |
| PL FLUOTAR | 2.5 x/0.07 | ∞/- | FWD* 9.20 mm | Order no. 567010 |
| HC PL FLUOTAR | 5 x/0.15 | ∞/-/D | FWD* 12.00 mm | Order no. 506504 |
| HC PL FLUOTAR | 10 x/0.30 | ∞/-/D | FWD* 11.00 mm | Order no. 506505 |
| HC PL FLUOTAR | 20 x/0.50 | ∞/0/D | FWD* 1.27 mm | Order no. 566500 |
| HC PL FLUOTAR | 50 x/0.80 | ∞/0/D | FWD* 0.50 mm | Order no. 566501 |
| HC PL FLUOTAR | 100 x/0.90 | ∞/0/D | FWD* 0.30 mm | Order no. 566502 |
| Spacer ring 32/25 | 7 x | | | Order no. 561003 |
| High-aperture oil immersion objective for high resolution | | | | |
| PL FLUOTAR | 100 x/1.30 | ∞/ Oil D | FWD* 0.13 mm | Order no. 506046 |
| Immersion oil, 10 ml (DIN 58884) | | | | Order no. 513787 |
| Spacer ring 32/25 | | | | Order no. 561003 |
| PL Apo series with RMS screw thread | | | | |
| PL APO | 50 x/0.90 | ∞/0/C | FWD* 0.28 mm | Order no. 567034 |
| PL APO | 100 x/0.95 | ∞/0/C | FWD* 0.16 mm | Order no. 567023 |
| PL APO | 150 x/0.95 | ∞/0/C | FWD* 0.20 mm | Order no. 567042 |
| PL APO | 250 x/0.95 | ∞/0/ | FWD* 0.24 mm | Order no. 767001 |
| Spacer ring 32/RMS | | | | Order no. 562281 |
| Objectives with specially long free working distances (RMS) | | | | |
| PL FLUOTAR | L 50 x/0.55 | ∞/0/C | FWD* 8.00 mm | Order no. 767002 |
| PL FLUOTAR | L 100 x/0.75 | ∞/0/ | FWD* 4.70 mm | Order no. 767000 |
| Spacer ring 32/RMS | | | | Order no. 562281 |

* FWD = free working distance

Objectives with long working distances with 1.8 mm quartz glass coverglass correction (M25x0.75)

| | | | | | |
|---|---|---|---|---|---|
| PLAN H | 20x/0.40 | ∞/1.8Ω B | FWD* | 12.60 mm | Order no. 566003 |
| PLAN H | 40x/0.60 | ∞/1.8Ω B | FWD* | 7.10 mm | Order no. 566004 |
| Spacer ring 32/25 | | | | | Order no. 561003 |

**For incident light brightfield and darkfield, polarisation contrast, interference contrast with M32x0.75mm screw thread***

Objectives for brightfield and darkfield with M32x0.75mm screw thread are screwed straight into the nosepiece without a spacer ring.

N PLAN objectives

| | | | | | |
|---|---|---|---|---|---|
| N PLAN | 5x/0.12 BD | ∞/-/A | FWD* | 13.20 mm | Order no. 566016 |
| N PLAN | 10x/0.25 BD | ∞/-/A | FWD* | 5.20 mm | Order no. 566005 |
| N PLAN | 20x/0.40 BD | ∞/0/D | FWD* | 1.10 mm | Order no. 566029 |
| N PLAN | 50x/0.75 BD | ∞/0/D | FWD* | 0.37 mm | Order no. 566030 |
| N PLAN | 100x/0.90 BD | ∞/0/D | FWD* | 0.30 mm | Order no. 566031 |

PL FLUOTAR objectives

| | | | | | |
|---|---|---|---|---|---|
| HC PL FLUOTAR | 5x/0.15 BD | ∞/-/D | FWD* | 12.20 mm | Order no. 566506 |
| HC PL FLUOTAR | 10x/0.30 BD | ∞/-/D | FWD* | 11.00 mm | Order no. 506503 |
| HC PL FLUOTAR | 20x/0.50 BD | ∞/0/D | FWD* | 1.27 mm | Order no. 566507 |
| HC PL FLUOTAR | 50x/0.80 BD | ∞/0/D | FWD* | 0.50 mm | Order no. 566504 |
| HC PL FLUOTAR | 100x/0.90 BD | ∞/0/D | FWD* | 0.30 mm | Order no. 566505 |

PL Apo objectives

| | | | | | |
|---|---|---|---|---|---|
| PL APO | 50x/0.90 BD | ∞/0/C | FWD* | 0.34 mm | Order no. 567013 |
| PL APO | 100x/0.95 BD | ∞/0/C | FWD* | 0.26 mm | Order no. 567014 |
| PL APO | 150x/0.95 BD | ∞/0/C | FWD* | 0.25 mm | Order no. 567015 |

Objectives with long free working distances

| | | | | | |
|---|---|---|---|---|---|
| PL FLUOTAR | L 20x/0.40 BD | ∞/0/C | FWD* | 11.10 mm | Order no. 766001 |
| PL FLUOTAR | L 50x/0.55 BD | ∞/0/C | FWD* | 8.10 mm | Order no. 766000 |

The following eyepieces are recommended for attaining the standard magnification

| | | | |
|---|---|---|---|
| HC PLAN | 10x/22 ⌀ M | 2x | Order no. 507804 |

Alternative eyepieces for the above objectives:

| | | |
|---|---|---|
| HC PLAN | 10x/20 ⌀ | Order no. 507801 |
| HC PLAN | 10x/20 ⌀ M | Order no. 507802 |

* FWD = free working distance

Other eyepieces outside the standard magnification

| | | |
|---|---|---|
| HC PLAN | 12.5 x/16 M | Order no. 506515 |
| 16 x/14 B, adjustable | | Order no. 445301 Leica Heerbrugg |
| 25 x/9.5 B, adjustable | | Order no. 445302 Leica Heerbrugg |

Non-HC series eyepieces from Leica Heerbrugg require a spacer ring, order no. 506 808 (62.2)

**n.b.:**

When wearing eyeglasses, remove the anti-glare protection of the eyepieces or push back the eyecups, or you will not be able to see the whole field of view.

The eyepiece field of view no. 22 should not be exceeded for the Leica DMIRM. Using eyepieces with higher field numbers (e.g. 25) can lead to vignetting at the edge of the image.


**Fig. 62** 16x/14B eyepiece
**1** Clamp screw, **2** Spacer rings for Leica microscopes (must be pushed up as far as the stop)

### 4.6 Eyepiece graticules*

Graticules for length measurements and grain and particle measurements

Our product range comprises the following graticules:

- Graticule 10 mm/100 divisions Order no. 506950
- Graticule 10 mm/100 divisions with crosshair Order no. 506952
- Graticule for standard series and Snyder-Graff method Order no. 566950
- Graticule ASTM-E-112, grain size determination Order no. 566951
- Graticule with 10 x 10 x 0.1 mm grid divisions Order no. 506954
- Graticule with 10 x 10 x 1 mm grid divisions Order no. 506955
- Graticule with crosshair Order no. 506953
- Graticule with 10 mm/200 divisions Order no. 506951
- Format graticule F6 for photomicro (for MPS with HC 10 x photoeyepiece) Order no. 506951
- Format graticule F7 for photomicro (for DMLD with HC 10 x photoeyepiece) Order no. 506962
- Format graticule F8 for photomicro (for DMLD and MPS with HC 12.5 x photoeyepiece) Order no. 506963

For calibrating the graticules, we recommend:

Incident light stage micrometer,
1 mm = 100 divisions Order no. 563011

**Graticule 10 mm/100 divisions (63)***

For graticules with a scale of 10 mm/100 divisions, one scale interval is roughly equivalent to the following lengths in the specimen plane:

0.02 mm = 20 µm for 5 x objective
0.01 mm = 10 µm for 10 x objective
0.005 mm = 5 µm for 20 x objective
0.002 mm = 2 µm for 50 x objective
0.001 mm = 1 µm for 100 x objective

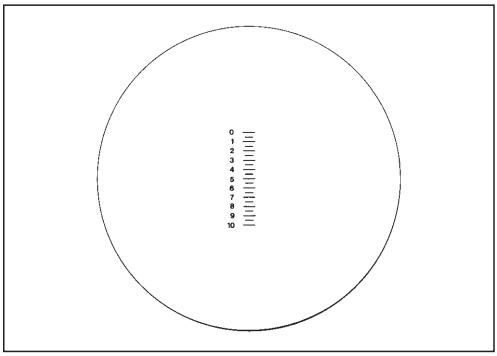


**Fig. 63** Graticule with 10 mm/100 divisions

**Graticule for standard series/Snyder-Graff (64)***

The graticule for the standard series and Snyder Graff methods contains a centre circle which frames an image area of 80 mm for the standard magnification.
The image area of 80 mm diameter corresponds to the grain images of standard series charts and enables exact comparison of grain sizes.
The centre circle can also be used for grain size determinations with the circle segment or area count methods.

The graticule also has a reference length for the Snyder Graff method.
This method involves counting the number of grains intersected by the reference line and then calculating the average grain size from several measurements.

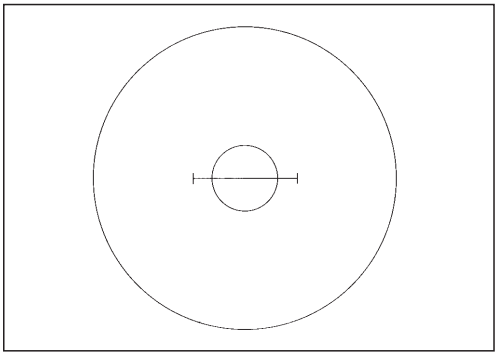


**Fig. 64** Graticule for standard series/Snyder Graff

**ASTM-E-112 graticule (65)***

The ASTM-E-112 is divided up into 8 segments with labelled grain size pictures.
The pictures conform to grain sizes plates no. 1A and 1B of the ASTM-E112 standard.
For reasons of space, the graticule contains 8 representative circular grain size images from a total of 22 of the above-mentioned plates 1A and 1B.

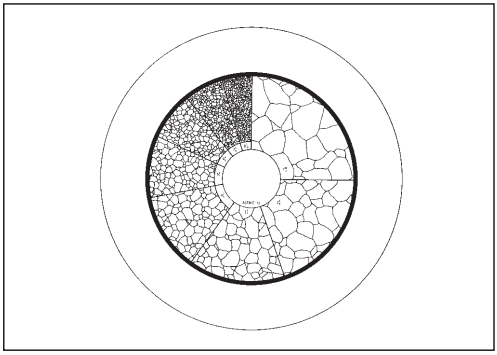


**Fig. 65** ASTM-E-112 graticule

**Inserting the graticules:**

The graticules have a diameter of 26 mm and can only be inserted in the eyepieces HC PLAN 10x/20/22/25 with type M adjustable eyelens. The second eyepiece in the tube should also have a type M adjustable eyelens.

**Caution:**

Make sure there are no dust or fingermarks on the graticule when inserting it, as these will show up on the microscope image.

### Eyepieces HC PLAN 10x/20 M and HC PLAN 12.5x/16 M*

Unscrew retainer ring on the underneath of the eyepiece (66.8a), perhaps using a rubber cloth.

### Eyepieces HC PLAN 10x/22 and HC PLAN 10x/25*

Unscrew lower part of eyepiece (66.7). Unscrew the slitted retainer ring (66.8b) out of the lower part with a blunt blade.

Insert the graticule with the coated side pointing downwards towards the objective.
Lettering must be shown the right way round.
Screw the retainer ring and the lower part of the eyepiece back in.


**Fig. 66** Eyepieces
**1–4** Eyepieces with anti-glare protection in position for non-eyeglass wearers, **5** PHOTO eyepiece, **6** 10x/25M eyepiece, disassembled, **6** Upper part, **7** Lower part, unscrewed (also applies for 10x/22M, 12.5 x 16M, but not for 10x/20 and 10x/20M, **8a, b** Retainer ring for eyepiece graticules, can be screwed out, **9** Eyepiece graticule*, **10** Anti-glare protection, removable for viewing with eyeglasses (for 10x/20 and 10x/22 eyepieces it can be pushed back, inserted and removed, pos. 8a and 8b). The design of the 12.5x/16M eyepiece is basically the same as that of the 10x/25M eyepiece.

### 4.7 Switching on and adjusting the 12 V 100 W halogen lamp

Switch on the power supply with the toggle switch (67.1) and adjust the light intensity by rotating the dial at the side.
Rotating the dial clockwise increases intensity and vice versa.
Please note that the halogen lamp only has a life expectancy of approx. 50 hours when the lamp current is turned on full.
We therefore recommend reducing the load current, especially when not actually using the microscope. This considerably increases the life expectancy of the lamp.

For colour photography the light intensity should be set at the position between 10 V and 11 V (colour temperature approx. 3200K) marked with the white dot.

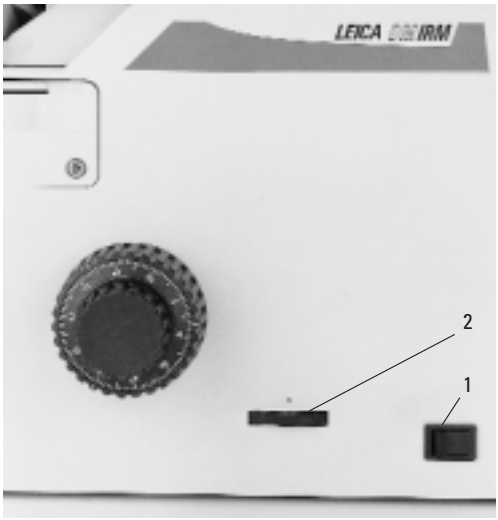



**Fig. 67** Side view of the microscope
**1** Toggle switch (mains switch), **2** Brightness adjustment dial

### 4.8 Centration of the 12 V 100 W, Hg, Xe lamps*

**Lamphousing 107/2 for 12 V 100 W halogen lamp**

This lamphousing is permanently set and does not require centration. However, it is essential that the lamp is aligned straight in its mount.

**Lamphousing 107 L for 12 V 100 W halogen lamp (68)**

2 alternative centration methods:

**Method 1:**
**Centration in the rear focal plane of the objective**

1. Turn a low-power objective into the light path and, using the BF reflector, focus on a strongly reflecting specimen (e.g. surface mirror) with the coarse and fine drive. Open the field and aperture diaphragm (72.1+3).
2. Remove the eyepiece from the right or left tube and look into the empty eyepiece tube.
3. Slightly reduce the light intensity until the back objective pupil (back lens surface of the objective) can be clearly seen.
4. Adjust the lamp collector (68.4) until you see the structure of the lamp filament. The filament image is divided into two with a pale stripe in the middle (69).
   Please note that only the central area of the filament can be seen and that the image is very low in contrast.
5. Using an Allen key (68.3), adjust the screw for horizontal adjustment (68.2) until the pale stripe of the filament image is in the centre of the pupil.
6. Then adjust the screw for vertical adjustment (68.3) to align the filament image vertically in the centre of the pupil.

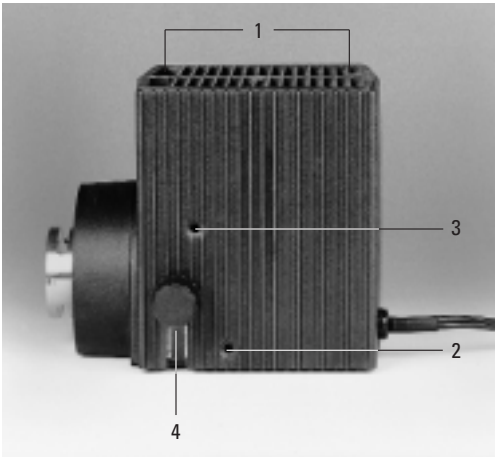



**Fig. 68** Lamphousing 107 L
**1** Cover fixing screws, **2** Screw for horizontal adjustment, **3** Screw for vertical adjustment, **4** Collector focusing

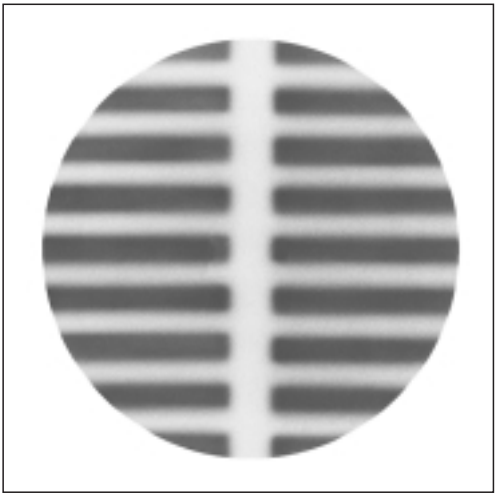


**Fig. 69** Lamphousing 107/2 and 107 L
Reflection of the lamp filament, (greatly schematized): the reflection is actually very low in contrast, the pale overlap area is wider and more blurred. For lamphousing 106 z the reflection is rotated by 90°.

**Method 2:**
**Centration in the plane of the specimen stage**

1. Put a piece of paper or non-shiny piece of Leica packaging on the specimen stage and roughly focus the surface with a low-magnification objective.
2. Set the field and aperture diaphragms at the middle position.
3. Make a dot or cross on the centration area with a felt or ball point pen and slide it into the centre of the spot of light. Fix with the specimen clip if necessary.
4. Screw out the objective or turn an empty nosepiece position into the light path.
5. Using the centring screws, slide the image of the filament into the middle of the centration area marked with a dot or cross, as described in Method 1.

**Lamphousing 106Z L with halogen lamp, Xe and Hg lamps**

(switch gas discharge lamps on and off at separate power units)

For lamphousing 106Z the direct lamp image and the reflection of the reflector are focused separately and aligned to each other.
Either of the above methods can be used for imaging the lamp filament or arc.

**Centration of 12 V 100 W halogen lamp**

Move the reflection of the filament to the side or entirely out of the light path by adjusting the centring screws on the back of the lamphousing (70.4, 71). Focus the direct image of the filament with the collector adjustment (70.6)
Then, using the centring buttons, adjust the image of the filament until the centration area or rear focal plane of the objective is half filled (71.b)

Then focus the reflection of the filament with the centring buttons for the reflector adjustment and align symmetrically to the direct image (72c).

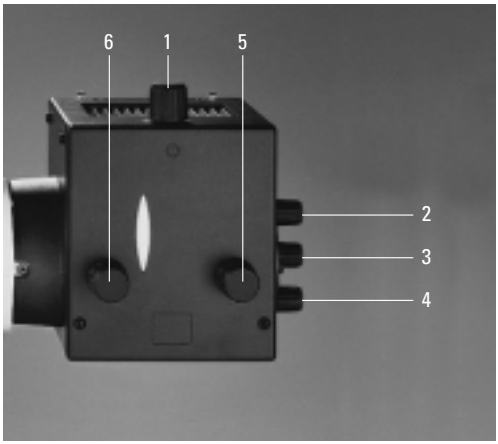



**Fig. 70** Lamphousing 106Z with Hg 100W lamp
**1** Lamp adjustment, vertical, **2** Reflector adjustment, **3** Focusing of the reflector image, **4** Reflector adjustment, horizontal, **5** Lamp adjustment, horizontal, **6** Collector focusing

**n.b.:**

Risk of glare with gas discharge lamps. Use neutral density filter (see p. 56).

**Centration of Xe or Hg gas discharge lamps**

**n.b.!**

Never look straight into the light path! Remember the risk of glare when switching to the BF or Smith reflector!

Move the reflection of the discharge arc to the side or entirely out of the light path by adjusting the centring screws on the back of the lamphousing (70.2, 3, 4).
Focus the direct image of the arc with the collector adjustment (70.6)

**Caution:**

Use the neutral density filter to reduce the intensity of the discharge arc image on the centration areas due to the risk of glare damaging the eyes.

Centre the arc images as follows:

**Hg 50 W mercury lamp**

Using the centring buttons (70.1, 70.5) move the direct image of the arc to the right or left of an imaginary line through the middle of the centration area (71a, b). Then focus the reflection (70.3) and, using the centring buttons of the mirror adjustment (70.2, 4), move the reflection until it is symmetrical with the direct image (71c).

**Hg 100 W and Xe 75 W lamps**

Using the centring buttons (70.1, 5) move the direct image of the arc to the middle of the centration area, with the bright tip of the arc, the focal spot of the cathode, just off centre.
Then focus the reflection (70.3) and, using the centring buttons of the reflector adjustment, move the reflection until it is symmetrical with the direct image (71a, b, c).
The V-shaped emissions of the arcs of the direct image and the reflection can be superimposed.

**Caution:**

The bright tip of the light arcs, the focal spots of the cathode, must never be projected on top of one another, as there is then a risk of explosion due to overheating.

Replace spent burners in good time and dispose of in an environmentally compatible way.
Open lamphousing only after cooling and disconnection from the mains.
Wear gloves and mask if using Xe lamps.
Hg lamps will reach their full intensity only after a few minutes, they do not ignite when hot.

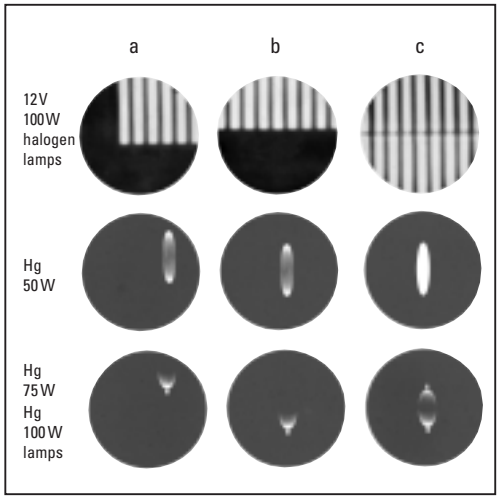



**Fig. 71** Schematic diagram of the lamp centration in lamphousing 106Z (in reality the lamp images are not as sharp)
**a** direct lamp image, focused, but decentred
**b** direct lamp image in correct position
**c** indirect and direct lamp image in correct position

## 4.9 Centring the aperture and field diaphragm

### Centring the aperture diaphragm

Turn a low to medium objective magnification 10x/20x into the light path and focus a strongly reflecting specimen (e.g. surface mirror) via the BF reflector with the coarse and fine drive.

Remove an eyepiece from one of the two eyepiece tubes and look into the empty tube.
Regulate the light intensity so that the rear objective pupil (rear lens surface of the objective) can be clearly seen.

Using the adjustment button (72.1), open the aperture diaphragm nearly to the edge of the pupil.
Centre the aperture diaphragm to the edge of the pupil with the centring screws (72.2).

The aperture diaphragm influences the resolution, contrast and field depth of the microscope image. Image quality greatly depends on how carefully it is set. It may not be used for regulating the image intensity.

### Centring the field diaphragm

Turn a low to medium objective magnification 10x/20x into the light path and focus a strongly reflecting specimen (e.g. surface mirror) via the BF reflector with the coarse and fine drive.
Open the field diaphragm almost as far as the edge of the field of view.
Using the centring buttons (72.4), centre the field diaphragm to the edge of the field of view.

The field diaphragm is imaged on the surface of the specimen, framing the illuminated field.

Normally, the field diaphragm is opened until it just disappears out of the field of view.
When imaging reduced picture diagonals such as in photomicrography or TV microscopy, the field diaphragm can be narrowed to frame the picture format, enhancing the image contrast.
The aperture diameter of the field diaphragm remains the same for all objective magnifications.

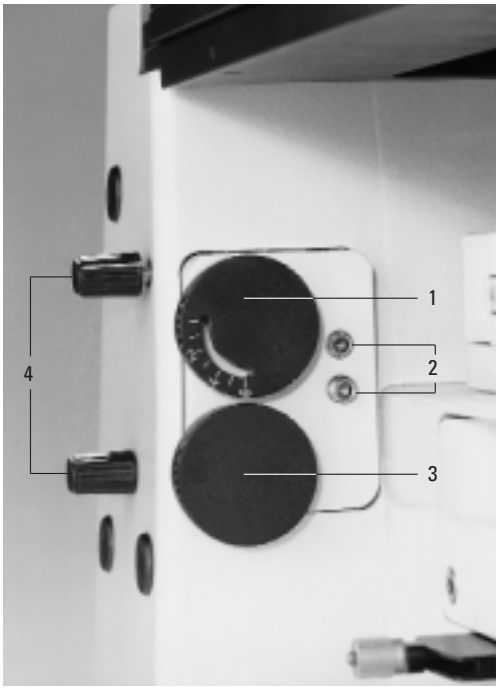



**Fig. 72** Aperture and field diaphragm
**1** Aperture diaphragm adjustment, **2** Aperture diaphragm centring screws, **3** Field diaphragm adjustment, **4** Field diaphragm centring screws

### 4.10 Use of light filters*

3 light filters are permanently integrated in the filter magazine (73).
These are moved into the light path via 3 switching levers (74.1).
It is not possible for customers to exchange these filters.

Upper lever – PG
Green filter, panchromatic – for general enhancement of contrast and black-and-white photography

Middle lever – DLF
Daylight filter, similar to CB 12 conversion filter for colour photography with daylight film.
For good and reproducible results with colour photography, the lamp intensity should be set at the white dot between 10 V and 11 V on the adjustment wheel of the power supply.

Lower lever – BG20
Contrast filter for enhancing red and blue for colour photography and video

Other filter positions

2 other positions for filters of 50 mm Ø diameter in holder in the lamp mount (7.2) and in the mirror housing (8)

2 other positions for filters of 50 mm diameter in holder in a special intermediate piece (75.2) which can be installed between the lamphousing and the lamp mount or mirror housing.

The following filters of 50 mm diameter are recommended:

Conversion filter CB 12
for colour photography with daylight film,
order no. 514093
Diffusing screen N
for diffusion and attenuation,
order no. 514042

VG 9
green filter for contrast enhancement,
order no. 514041

Neutral density filter 0.2 %
for light attenuation without influencing the colour temperature,
order no. 514031

ALF filter
artificial light filter for enhancing contrast in colour photography with artificial light film,
order no. 514756

Protection filter for incident light polarisers (39.1)
To protect incident light polarisers when using gas discharge lamps (Hg, Xe), a Pol protection filter must be inserted in the lamphousing mount.

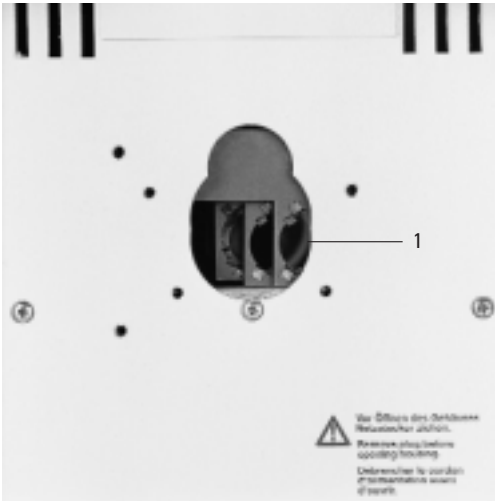



**Fig. 73** Back view of microscope without lamphousing mount
**1** Filter, 20 mm diameter, can only be fitted by service technician

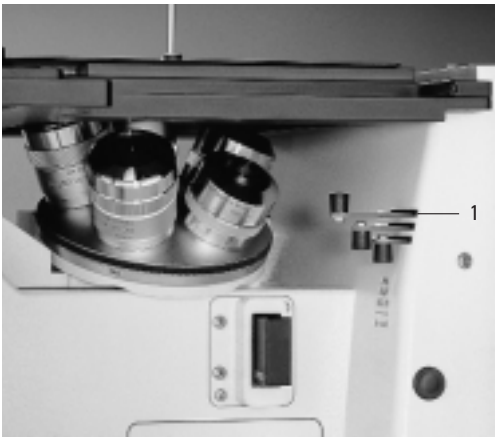



**Fig. 74** Side view of microscope
**1** 3 levers for operating filters

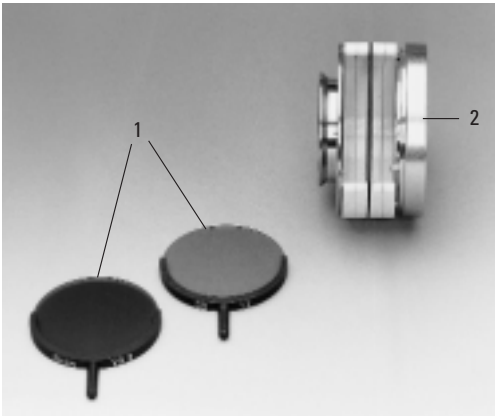



**Fig. 75** Intermediate filter holder
**1** Light filters, 50 mm diameter, **2** Intermediate piece with filter spaces

## 4.11 Examinations in incident light brightfield, darkfield, polarisation contrast, interference contrast

Please proceed as follows for selecting and setting contrasting techniques:

**Incident light brightfield:**

Turn a BF or Smith reflector into the light path by rotating the turret (76.1).
If using gas discharge lamps or if looking at strongly reflecting surfaces or switching quickly between brightfield and darkfield, it is advisable to slot an N16 neutral density filter (29.2) into the ring mount of the BF reflector (but not recommended for polarisation contrast and interference contrast).
Rotate the ICR prism turret (if used) to the BF position to disengage the ICR prisms.
Pull or swing the polariser, analyser, ICR prism out of the light path.

Turn a low magnification into the light path and adjust the illumination to a medium setting.
Make sure the front lens of the objective is clean, close the field diaphragm (76.4) half way, open the aperture diaphragm (76.5).
Focus the specimen surface, the half-closed field diaphragm makes it easier to find the specimen surface.

Open the field diaphragm until it just disappears beyond the edge of the field of view. The setting of the field diaphragm remains the same for all objective magnifications.

The aperture diaphragm influences the resolution, contrast and field depth of the microscope image.
It should be opened just wide enough to encompass the entrance pupil of the objective (brighter circle) and to cut off stray light at the walls of the microscope.

Then the illumination aperture is equal to the objective aperture (77.1).
This can be checked by looking through the empty eyepiece tube after removing one of the eyepieces (77). If included in the configuration, the Bertrand lens can be engaged for magnified viewing.

In general the aperture diaphragm is varied according to the visual impression of the specimen, contrast and field depth. We recommend closing the aperture diaphragm by 1/3 (77.2).
Narrowing the aperture diaphragm too far results in pronounced diffraction phenomena at weak and medium objective magnifications.
With high aperture, high-magnification objectives the aperture diaphragm can be narrowed further, which generally leads to a major improvement in contrast (77.3).
The aperture diaphragm must not be used for adjusting the image brightness.

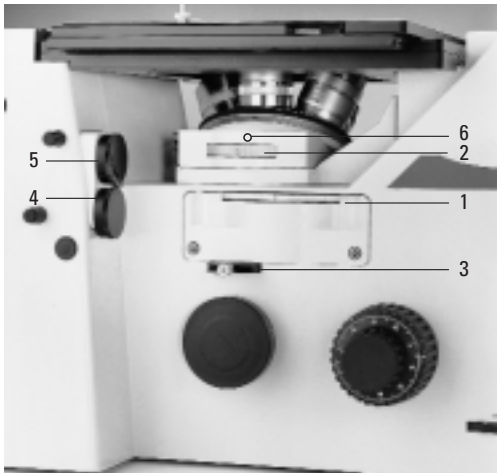



**Fig. 76** Side view of microscope
**1** Reflector turret, **2** ICR turret, **3** Analyser (polariser on other side of microscope), **4** Field diaphragm, **5** Aperture diaphragm, **6** Position of the knurled knob for ICR contrast setting

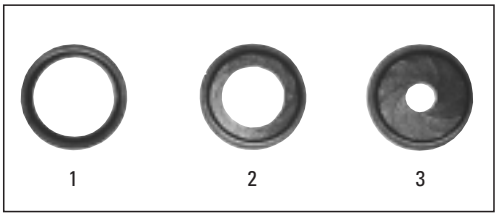



**Fig. 77** Setting the aperture diaphragm (entrance pupil of the objective)

**1** Aperture diaphragm open, **2** Aperture diaphragm closed by 1/3, **3** Aperture diaphragm closed

**Incident light darkfield***

Special darkfield objectives (BD type) (78.1) with built-in annular mirror and annular lenses are required for incident light darkfield.
These objectives have larger outer diameters and screw thread M32x0.75mm. They are directly adaptable to the DMIRM nosepiece without a spacer ring.
High light intensity is needed for darkfield as only diffracted and diffused light is used to form the image.

Turn the DF reflector into the light path using the turret (76.1).

Rotate the ICR prism turret (if used) to the BF position to disengage the ICR prisms.

Pull or swing the polariser, analyser, ICR prism (78.2, 76.2, 76.3) out of the light path.

Turn a low magnification into the light path and adjust the illumination to a medium intensity setting.
**n.b.:** Make sure the front lens of the objective is clean, as impurities on the front lens greatly impair the quality of the darkfield image.

Fully open the field diaphragm (76.4) and aperture diaphragm (76.5).

Depending on the surface topography, the quality of the darkfield image can be optimised, especially when using high objective magnifications, by narrowing the aperture diaphragm slightly.

! **n.b.:**

If you switch quickly between the DF reflector (darkfield) and the BF reflector (brightfield) there may be a sudden great difference in brightness when looking through the tube.

To match the image intensity when switching to brightfield, slot a neutral density filter onto the BF reflector. (29.2)


**Fig. 78** Side view of microscope
**1** Brightfield/darkfield objective (BD), **2** Polariser, **3** Magnification changer 1.5x or tube lens 1x

**Polarisation contrast***

Adjust the microscope as for brightfield examinations.

**Incident light polariser R/P in slide (79)**

Adjust the polariser to the vibration direction 0° = east-west (polariser can be plugged in different positions)
Push the polariser into the polariser slot as far as the stop (78.2)
Slide the IRM ICR/P analyser (76.3) into the analyser slot as far as the stop.
Swing the analyser (76.3) round the zero position until you achieve the greatest possible extinction.

**Incident light polariser 90°, rotatable, with rotatable whole-wave compensator (80)**

Set the vibration direction 0° = east-west with the dial (80.1).
Together with the analyser IRM ICR/P 90° = north-south, the polariser and analyser are in a crossed position.
Polarisation-optic colour contrast is produced with crossed polarisers and rotation of the compensator (80.2).
The rotation range of the compensator is about 14°.
This polariser is particularly useful for fine variations of the pol-optic colour contrast of anisotropic metal surfaces (e.g. aluminium, zircon, titanium).

**Incident light polariser L ICR/P with whole-wave compensator, reversible (81)**

For use with DMIRM with permanently oriented vibration direction 0° = east-west.
The compensator is permanently oriented in the diagonal position 45° and can be activated and deactivated by turning the polariser slide over by 180° (engraving).

When the compensator is activated, pol-optic colour contrast with a fixed retardation of one wavelength is produced (1st order red).

**n.b.:**

When using gas discharge lamps (Hg, Xe), make sure to insert a pol protection filter, order no. 504079, into the lamphousing 106Z to prevent irreparable damage to the polarisation foil (39.1).

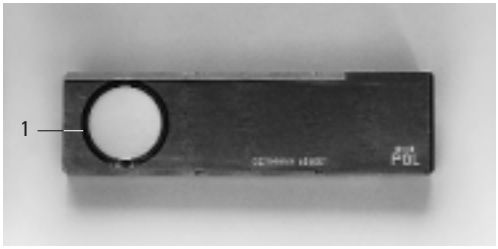



**Fig. 79** Incident light polariser R/G
**1** Polariser mount with 0°, 45°, 90° clickstops


**Fig. 80** Incident light polariser 90°, rotatable, with whole-wave compensator
**1** Polariser adjustment, **2** Compensator knob


**Fig. 81** Incident light polariser L ICR/P

**Incident light interference contrast ICR**

Adjust the microscope as for brightfield examinations.
The Smith reflector (31) is an excellent alternative to the BF reflector for ICR due to the low depolarisation at the beamsplitter plate

Insert the **incident light polariser L ICR/P** with compensator, reversible (81, 78.2) and **analyser IRM ICR/P** into the light path.
Deactivate the compensator in the polariser (turn over by 180°, see lengraving)

Switch the ICR prism turret to the brightfield setting (BF) so that the ICR prisms are out of the light path (76.2, 81a.1).

Focus on a homogeneous, strongly reflecting specimen.
Swing the analyser IRM ICR/P (76.3) round the zero position until the greatest possible extinction is attained.
n.b.: The polariser and analyser must be exactly crossed to obtain good ICR quality.

Instead of the polariser and analyser in the slide and the BF or Smith reflector, the ICR reflector module with built-in polariser and analyser and the $MgF_2$ plate can be used (although colour interference contrast is then only possible by considerably altering the position of the ICR prism turret (76.2)).

Swing in an ICR prism by rotating the prism turret (76.2) and set ICR contrast on the prism turret with the knurled knob (34.6, 76.6, 81.2). In addition, adjust the aperture diaphragm to optimise image contrast.
To set ICR colour contrast, turn the polariser L ICR/P over by 180° so that the lambda engraving points towards the user (the compensator is now between the crossed polariser/analyser.)

**Choice of ICR prisms:**

The right type of prism for the particular objective is engraved on the objective sleeve.

e.g. Prism A for N PLAN 5x and 10x objectives
Prism D, D1 for N PLAN 20x, 50x, 100x and PL FLUOTAR 5x-100x objectives

Prism D features greater shearing, providing higher detection sensitivity for minute topological differences.
Instead, prism D1 can be used, which has less shearing than prism D. Although it has lower detection sensitivity for topological differences, it offers better lateral resolution of structures.

The shearing effect is not as pronounced in all directions.
For linear object structures, therefore, the specimen has to be rotated to obtain the most favourable contrast position.

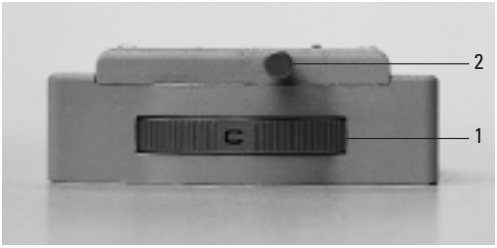



**Fig. 81a** ICR prism turret
**1** Prism turret, **2** Knurled knob

### 4.12 Examinations in incident light fluorescence

Select a filter cube to suit the excitation and emission spectrum of the specimen and switch into the light path with the reflector turret (76.1).
All polarisation-optic components, such as the polariser, analyser and ICR prisms must be removed from the light path.

If included in the configuration, turn the magnification changer (78.3) into position 1x to ensure maximum light intensity.

Open the aperture diaphragm (76.5) and the field diaphragm (76.4) to improve intensity.

If using Hg or Xe gas discharge lamps, an additional increase in intensity can be achieved by assembling the illumination telescope (booster) (8.4) between the lamphousing and the lamphousing mount.

Always block the incident light path when you are not actually looking through the microscope to prevent specimens fading.
This can be done by diverting the light at the mirror housing with a lever (8.1) or changing the position of the filter cube in the turret.

**n.b.:**

Remember the risk of glare due to high light intensity when switching from the fluo filter cube to the brightfield reflector.

## 4.13 Examinations in transmitted light

### Adjusting the height of the condensers:

There are markings (S70, S23 and S1, 48.3) on the transmitted light illumination column for correct setting of the condenser height.
After slackening the screw with the supplied hexagonal screwdriver, move the condenser or condenser holder you are using until its upper edge is flush with the relevant marking on the illumination column.
Screw down the condenser and condenser holder again (82.4 + 5).

### Brightfield illumination with condenser 0.30 S70 (83)

Brightfield illumination is possible with objective magnifications from 2.5 x to 40 x.
Turn a 10 x objective into the light path and focus with the coarse and fine drive.
Close the aperture diaphragm until you achieve the desired image contrast.

### Brightfield illumination with condensers 0.53 S23 and 0.90 S1 (84, 85)

Brightfield observation is possible with condenser S 0.53 S23 with objective magnifications from 5 x to 100 x.
Condenser 0.90 S1 is designed for objective magnifications from 10 x–100 x.

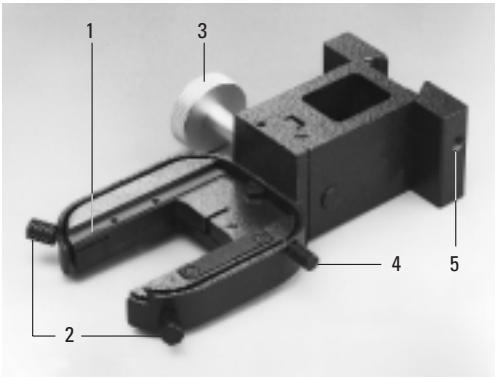



**Fig. 82** Condenser holder
**1** Condenser slide changer, **2** Condenser centring screws, **3** Condenser height adjustment, **4** Condenser clamp screw, **5** Condenser holder clamp screw

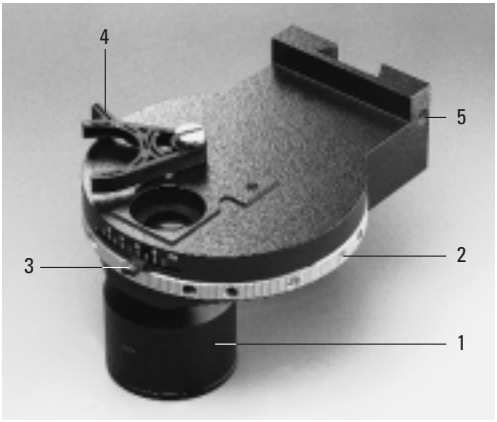



**Fig. 83** Condenser 0.30 S70
**1** Condenser top 0.30 S70 (not for use with condenser base (8.1)), **2** Condenser disc, **3** Aperture diaphragm, **4** Filter holder, **5** Condenser clamp screw

**Setting Koehler illumination**

Turn the 10x objective into the light path and focus the specimen.

1. Turn the condenser disc (84.3) to the "H" clickstop position (H = Hellfeld= brightfield)
2. Close the field diaphragm (48.8)
3. Adjust the height of the condenser (82.3) until the edge of the field diaphragm is sharply focused.
4. Centre the field diaphragm with the two condenser centring screws (82.2) in the middle of the field of view.
5. Open the field diaphragm until it just disappears from the field of view.
6. The field diaphragm centration may need slight readjustment when an objective is changed.

The field diaphragm protects the specimen from unnecessary warming and enhances the image contrast. It is therefore only opened wide enough to illuminate the observed or photographed field. Superfluous light is kept away from the specimen.
Therefore, the field diaphragm should be readjusted and adapted when the objective magnification is changed.

Close the aperture diaphragm (84.4) until you obtain the desired image contrast.

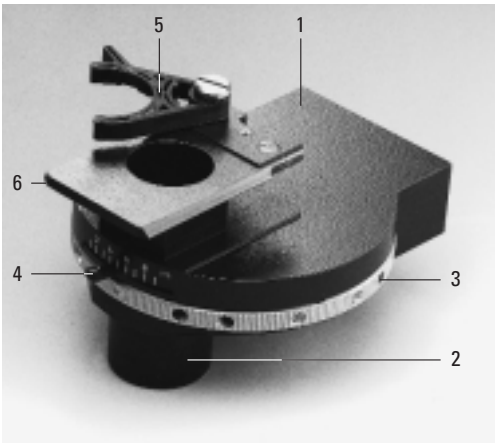



**Fig. 84** Condenser 0.53 S23
**1** Condenser base, **2** Condenser top 0.53 S23 (interchangeable), **3** Condenser disc, **4** Aperture diaphragm, **5** Filter holder, **6** Dovetail guide

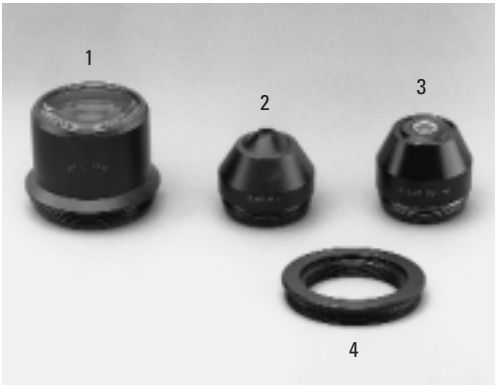



**Fig. 85** Condenser tops for condenser base (84.1)
**1** Condenser top 0.53 S23, **2** Condenser top 0.90 S1, **3** Condenser top P 1.40 OIL S1, **4** Spacer ring for assembly of 9.2 and 9.3

### 4.14 Length measurements

Eyepiece graticules or, with the slide overlay device, measurement scales can be used for taking length measurements in the DM IRM.

For measurements on the TV screen we recommend the video measurement crosshair Leica DMMFK2.

For the eyepiece graticules with scale 10 mm = 100 divisions and for the measurement scales 10 mm = 100 divisions of the slide overlay device at standard magnification and using a PLAN HC 10 x eyepiece, one scale division corresponds roughly to the following lengths in the specimen plane:

0.02 mm = 20 µm with 5x objective
0.01 mm = 10 µm with 10x objective
0.005 mm = 5 µm with 20x objective
0.002 mm = 2 µm with 50x objective
0.001 mm = 1 µm with 100x objective

For the exact measurement of scale intervals for different objective magnifications and intermediate systems, comparison with a calibration standard or stage micrometer is necessary (e.g. stage micrometer 100 mm/100 divisions, order no. 563011).

Align the stage micrometer and the graticule scale and compare the lengths of the intervals.
If, for example, 1.220 mm of the stage micrometer corresponds to 50 divisions of the graticule, the length of a scale interval of the graticule is 1.220 : 50 = 0.0244 mm = 24.4 µm.

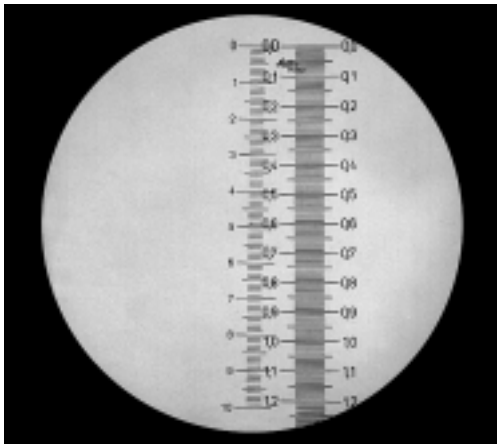


**Fig. 86** Scale of the graticule in the eyepiece (left) and the image of the stage micrometer (right).

# 5 Accessories

## 5.1 Inserting and working with the slide overlay device and macro device

The devices for slide overlay and macroscopy can only be used with the HC FSA 25PE tube.

**Slide overlay device:**

Mount the reflection optics (87.3) onto the tube flange (87.1) with the coupling ring; engage the guide pin in the groove and screw down. In the same way, screw the slide overlay device with coupling ring (87.4) to the reflection optics.

**Changing the 6V4W halogen lamp in the illumination tube:**

Open the back of the illumination tube with an Allen key (87.10) and remove the lamp part.
Take the lamp out of the base and exchange.
Please make sure that contact paths of the lamp and the base overlie.

Close the illumination tube.
The lamp mount can be adjusted by a vertical distance of about 2 mm by applying keys from underneath (87.9).
Looking through the eyepiece, adjust the height of the lamp until you obtain the brightest image.

Connect the slide overlay device via a transformer to the mains.
Put one of the supplied slides in the integrated slide holder.

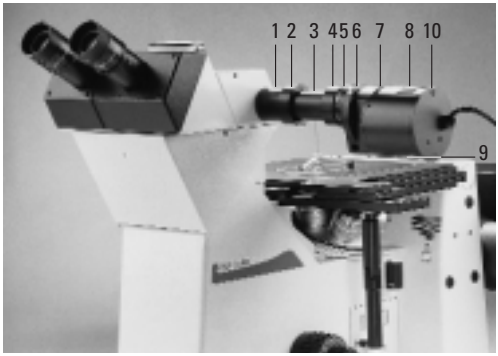



**Fig. 87** Slide overlay device on the FSA 25 PE tube (with tube adapter IR/R HC)
**1** Tube flange, **2** Coupling ring of reflection optics, **3** Reflection optics, **4** Coupling ring of slide overlay device, **5** Knurled focusing ring, **6** Slide holder 5 x 5 cm, **7** Filter slot, **8** Illumination tube of lamphousing, **9** Lamp holder adjustment, **10** Allen screw for changing the lamp

**Fig. 88** Transformer for slide overlay device

**Slides with the following line patterns are available:**

– Marker arrow
– Measurement scale 10 mm = 100 divisions
– µm marks for 2.5 x–100 x objectives
– 10 x 10 mm grid division

– Standard circle and reference length for grain size measurements
– Standard picture series for ASTM-E-112 grain size measurements

You can make your own masks with any measurement and comparison line patterns, quality data, company logos, etc. The original master has to be copied on a 35 mm negative, preferably on fine-grain document film.

The transparency is imaged at the scale 2:1 in the intermediate image plane of the microscope. A distance of 5 mm in the slide overlay is magnified to 10 mm in the intermediate image plane of the microscope.

The slide overlay device only works when the beamsplitter in the FSA 25 PE tube is set at 50/50 (switch rod in the middle position).

The framed slide is inserted in the integrated holder (87.6) with the lettering on the slide facing the microscope.

The holder is adjustable on all sides, so the overlay can be moved to different areas of the microscope image.
Remember that when you move the slide, the overlay will move in the opposite direction. This takes a bit of getting used to.

You can give the white lines a coloured background by putting 32 mm colour filters in the filter slot (87.7).

**Macro device**

Mount the reflection optics (89.3) to the tube flange (89.1) with the coupling ring; engage the guide pin in the groove and screw down.
In the same way, screw the macro device to the reflection optics with coupling ring (89.4).

An image cannot be obtained without the reflection optics.

Like the slide overlay device, the macro overlay only works in the 50/50 beamsplitter position (switch rod in middle position) of the FSA 25 PE tube.
The microscope illumination is left switched off to avoid disturbing image brightening.
The object is placed on the stage under the mirror housing of the macrodual zoom (89.11) and illuminated.
Stand lamps, cold-light illuminators and fibre-optic lamps, etc. are suitable sources for microscopy.
The image is observed in the microscope tube and focused by turning the knurled ring (89.10).
The magnification can be changed continuously in a range of 1:4 by adjusting the zoom ring (89.7). When changing the magnification with the zoom control the image has to be slightly refocused with the knurled ring (89.10). The zoom magnification factors can be read on the scale (89.8). The magnification also changes when the distance between the object and the macro attachment is varied.
The total magnification in the microscope, the reproduction ratio on the photograph or TV image can be quickly and easily measured with a scale and calculated.

**n.b.:** For normal viewing without the macro mirrorhousing or macrodual zoom, put on the cover to avoid disturbing overlay effects.

The mirror housing (89.11) can be rotated through 360°, for example to alter the angle at which the photograph is taken. This is done by loosening the Allen screw.

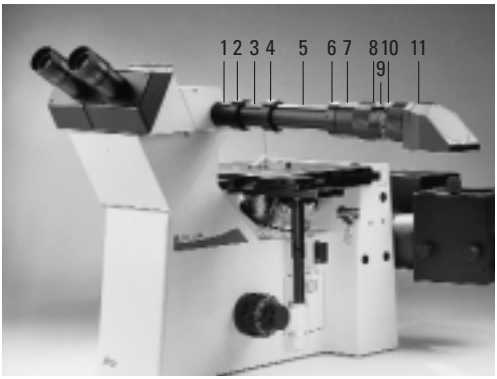



**Fig. 89** Macro device on FSA 25 PE tube with tube adapter IR/R HC
**1** Tube flange, **2** Coupling ring, **3** Reflection optics, **4** Coupling ring, **5** Macro adapter, **6** Screw ring, **7** Zoom setting ring 1:4, **8** Scale of zoom factor, **9** Scale of magnification factor of the working distance, **10** Scale of object distance from the bottom edge of the mirror housing, **11** Mirror housing

The intermediate image magnification M1 of the macro object can be worked out from the eyepiece field of view and the diameter of the object field (measured with a graduated ruler) as follows:

$$M1 = \frac{\text{field of view } Ø}{\text{object field } Ø} \quad \text{e.g.} \quad \frac{\text{10x/20 eyepiece}}{\text{object field} = 200\,\text{mm}} \quad M1 = 0.1$$

Viewed with a 10 x eyepiece, this intermediate image of 0.1 x gives a total magnification of 1 x in the microscope eyepiece (0.1 x 10 = 1x).

The total magnification of the film plane of a camera is derived from multiplying the intermediate image magnification $M_1$ by the magnifications of the photo eyepiece and camera attachment, e.g.
intermediate image magnification 0.1 x
photo projection lens 10 x
camera factor 35 mm 0.32 x
0.1 x 10 x 0.32 = 0.32 x

The total magnification at the 35 mm camera of the DM LD is therefore 0.32 x.

The total magnification can be roughly calculated with the scale divisions on the macrodual zoom:

The following factors have to be multiplied for this:
– Magnification factor of the working distance (scale (89.9), e.g. 0.11 x)
– Zoom factor (scale (89.8), e.g. 1 x)
– Correction factor of the reflection optics (without engraving 1.17 x)
– Eyepiece magnfication (e.g. 10 x)
e.g. 0.11 x 1 x 1.17 x 10 = 1.29
The total magnification in the eyepiece would therefore be 1.29 x

**Use of the macrodual zoom as a drawing device**

Drawing microstructures under the microscope has the advantage over photomicrography that significant details can be highlighted and that structures can be depicted in three dimensions. This is not possible with photomicrography. Apart from this, drawing with the superimposed image method is a valuable didactic exercise.
It is done by superimposing the drawing area (the area of the stage under the mirror housing of the macrodual zoom) onto the microscope image. The drawing area or sheet of paper is homogeneously illuminated with a stand lamp or table lamp.
The microscope illumination and illumination of the drawing area are matched providing the lamps are adjustable; otherwise the brightness of the drawing area can be varied by altering the proximity of the lamp.

## 5.2 Connections for TV cameras and photo-micro equipment

All the variants of the Leica DMIRM stand have a photo/TV exit on the left side (90).
There are also photo/TV exits in the trinocular tubes for vertical adaption of camera systems.

Various adapters are available for connecting TV cameras with c-mount or B-mount objective thread:

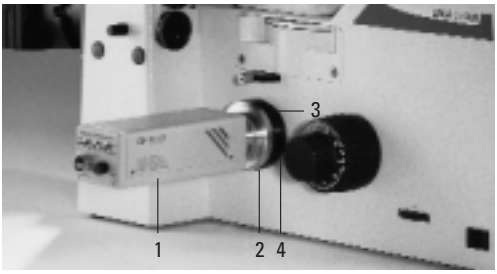



Fig. 90 C-mount adapter on side port
**1** TV camera, **2** Adapter with C-mount thread (or B-mount bayonet), **3** Clamp screw, **4** Photo adapter tube

| | Recorded picture diagonal in mm with | | | | |
|---|---|---|---|---|---|
| | 1 inch camera | 2/3 inch camera | 1/2 inch camera | 1/3 inch camera | Order no. |
| **without zoom magnification, for 1 chip cameras:** | | | | | |
| c-mount adapter 1 x HC | 16 | 11 | 8 | 6 | 541 510 |
| c-mount adapter 0.63 x HC+) | – | 17.5 | 12.7 | 9.5 | 541 537 |
| c-mount adapter 0.5 x HC | – | – | 16 | 12 | 541 511 |
| c-mount adapter 0.35 x HC | – | – | – | 17.1 | 541 512 |
| c-mount adapter 4 x HC+) | 4 | 2.8 | 2 | 1.5 | – |
| **without zoom magnification, for 1–3 chip cameras:** | | | | | |
| c-mount adapter 1 x | – | – | 16 | 12 | 541 706 |
| B-mount adapter 1 x | – | – | 16 | 12 | 541 702 |
| B-mount adapter 1.25 x | – | 17.5 | – | – | 541 539 |
| F-mount adapter 1 x | – | – | 16 | 12 | 541 540 |
| F-mount adapter 1.25 x | – | 17.5 | – | – | 541 541 |
| required for each: TV adapter 0.5 x HC | | | | 541 706 | |
| **with zoom magnification (Vario TV adapter):** | | | | | |
| c-mount, 0.32–1.6 x HC | – | – | 19++)–5 | 18–3.8 | 541 517 |
| B-mount, 0.5–2.4 x HC (SONY) | – | – | 16–3.3 | – | 541 518 |

+) in preparation ++) from zoom factor 0.42 x only!

### Calculation of the magnification on the monitor

For all TV exits the magnification on the monitor can be calculated with the following formula:

$$M_{TV} = \text{objective magnification} \times \text{tube factor} \times \text{TV adapter magnification} \times \frac{\text{monitor diameter}}{\text{chip diameter of camera}}$$

If using the magnification changer, e.g. 1.5x (57.1), the above formula must also be multiplied by the factor of the magnification changer or zoom.

The following Leica microscope camera systems are optically and mechanically compatible for photomicrography:

Leica MPS 30
Leica MPS 60
Leica DMLD

To adapt the microscope camera systems, the following photoeyepieces and eyepiece adapter tubes are required:

Eyepiece HC 8x/20 PHOTO
Eyepiece HC 10x/16 PHOTO
Eyepiece HC 12.5x/13 PHOTO

Eyepiece adapter tubes for eyepieces HC 10x/16 PHOTO (MPS)
Eyepiece adapter tubes for eyepieces HC 12.5x/13 PHOTO (MPS)
Eyepiece adapter tubes for eyepieces HC 8x, 10x, 12.5x PHOTO (DM LD)
Please also read the separate manuals for the microscope camera systems.

# 6 Care and maintenance

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

**Dust protection**

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 or stands. Thorough cleaning after use is strongly recommended. Keep the microscope optics absolutely clean.

**Dust/optics**

Remove any dust from glass surfaces with a fine, dry, grease-free artists' hair brush, or by blowing with a bellows ball or by vacuum suction. Any remaining dirt can be removed with a clean cloth moistened with distilled water. Failing this, use pure alcohol, chloroform or benzine.

**Oil (see p. 11)**

First wipe off immersion oil with a clean cotton cloth, then wipe over several times with ethyl alcohol.

Fibre and dust residue can cause disturbing background fluorescence in fluroescence microscopy.
Objectives must not be opened for cleaning. Only the front lens can be cleaned in the ways described above and the upper lens by blowing dust off with a bellows ball.

All Leica instruments are manufactured and tested with extreme care. If you do have cause for complaint, however, please do not try to repair the instruments and their accessories yourself. Contact your national agency or our central servicing department, the Technical Service in Wetzlar, direct. Postal address:

Leica Microsystems Wetzlar GmbH
Abt. Technischer Service
Postfach 20 40
D-35530 Wetzlar

Tel.: (0) 6441 - 29 28 49
Fax: (0) 6441 - 29 22 66

# Leica DM IRM

## Main wearing and spare parts, tools

| Order no.<br>Part no. | Component | Used for |
|---|---|---|
| **Spare lamps** | | |
| 500 974 | Halogen lamp 12V 100W | Lamphousing 106 z L, 107 L |
| 500 137 | Ultra high pressure Hg lamp 50W | Lamphousing 106 z L |
| 500 138 | Ultra high pressure Hg lamp 100W | Lamphousing 106 z L |
| in preparation | Ultra high pressure Hg lamp 100W (103W/2) | Lamphousing 106 z L |
| 500 139 | Ultra high pressure xenon lamp 75W | Lamphousing 106 z L |
| **Tools, adjustment keys** | | |
| 016-500.020-001 | Hexagonal screwdriwer | Assembly and adjustment of |
| 023-123.030-027 | 2mm Allen key | light rings, UCL condenser |
| 020-434.045 | 2.5mm Allen key angled, short | Assembly of heating stage and illumination mirror |
| **Screw cover for unoccupied nosepiece positions** | | |
| 020-422.570-000 | Screw cover M 25 | Objective nosepiece |
| 512 027 | Screw cover M 32 | BD objective nosepiece |
| **Spare eyecups (glare protection) for HC PLAN eyepiece** | | |
| 021-500.017-005 | Eyecup HC PLAN | 10x/25 eyepiece |
| 021-264.520-018 | Eyecup HC PLAN | 10x/22 eyepiece |
| 021-264.520-018 | Eyecup HC PLAN | 10x/20 eyepiece |
| **Immersion oil, DIN/ISO standard, fluorescence-free** | | |
| 513 787 | 10 ml | OIL and IMM objectives |
| 513 522 | 100 ml | and oil-condenser tops |
| 513 788 | 500 ml | |
| **Spare fuses, IEC 127-2 and/or UL 198 G standard and/or Wickmann company 19195, Schurter FST** | | |
| 846-205.000-000 | T 4 A | DM IRM microscope mains unit (for 12V 100W halogen) stabilised |
| 823-493.000-000 | T 2.5 A for 90–140V | Power unit Xe 75 Hg 100 stabilised (500 311) |
| 827-902.000-000 | T 1.25 A for 90–140V/ 187–264V | |
| 824-716.000-000 | T 160 mA for 90–140V | |
| 826-095.000-000 | T 80 mA for 187–164V | |
| 845-410.000-000 | T 3.15 A | Power unit Hg 100 non-stabilised (500 319) |
| Without fuses:<br>302-053.023-001 Ignition capacitor | | Power unit Hg 50 (500 277) |

# 7 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:** | **DM IRM** |
| Instrument type: | Light microscope |
| Instrument no.: | 090-133.701 to 706 |
| EU directives: | Low voltage: 73/23/EWG<br>Electromagnetic compatibility: 89/336/EWG |
| Harmonised standards applied: | EN 50081-1: 1992<br>EN 50082-1: 1997<br>EN 61010-1: 1993 |

Wetzlar, 23. 10. 1998

Prof. Dr.-Ing. habil. M. Jacksch,
Director of Technology and Development Engineering

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