



# Leica DM IRB

Instructions

*Leica*

Issued in 1998 by:

Leica Microsystems Wetzlar GmbH  
Ernst-Leitz-Strasse  
D-35578 Wetzlar (Germany)

Responsible for contents:

Marketing MQM, product management,

Tel. +49 (0) 64 41-29 25 19

Fax +49 (0) 64 41-29 22 55



# Leica DM IRB

Instructions

*Leica*

# Copyrights

All rights to this documentation and the software it describes are owned by Leica Microsystems Wetzlar GmbH. Copying of text and illustrations – in full or in part – by printing, photostat, microfilm or other techniques, including electronic systems, is only permitted subject to the express written consent of Leica Microsystems Wetzlar GmbH.

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

<b>Important notes on this manual</b> .....	<b>7</b>	<b>Assembly</b> .....	<b>17</b>
<b>General safety information</b> .....	<b>8</b>	Assembly tools .....	17
<b>Intended application</b> .....	<b>10</b>	Assembly of the transmitted light illumination column .....	17
<b>The microscope and its components</b> .....	<b>11</b>	Assembly of condensers .....	18
Key subassemblies .....	11	Assembly of IC condenser prisms .....	21
Stands .....	12	Condenser top .....	22
Tube mount .....	12	Condenser 0.30 S70 .....	22
Tube .....	12	Condenser 0.53 S23 and 0.90 S1 .....	23
Brightness adjustment .....	13	Assembly of field diaphragm .....	24
Coarse and fine control .....	13	Assembly of filters and filter holder .....	24
Mains switch .....	13	Assembly of ICT objective prisms, IC module and IC objective prisms .....	25
Incident light fluorescence device .....	13	Differences between prisms D and D1 .....	26
Aperture diaphragm .....	13	Inserting the analyser/polariser .....	26
Condenser .....	13	Inserting the fluorescence module .....	27
Condenser height adjustment .....	13	Assembly of the lamp mount, mirror housing, lamphousing, illumination telescope .....	27
Specimen stages and accessories .....	14	Assembling and exchanging incident light lamps .....	29
Objective nosepiece and objectives .....	14	Lamphousing 107 L .....	29
IR/R tube adapter .....	14	Lamphousing 106 z L .....	30
Eyepieces .....	14	Assembling and exchanging Hg and Xe lamps .....	31
Transmitted light illumination unit .....	14	Assembly of the tubes and tube adapter IR/R .....	33
Field diaphragm .....	14	Adaption of the slide overlay device and the macro dual system .....	36
Lamphousings .....	14	Inserting the eyepieces/graticules .....	37
Filters .....	14	Inserting the photoeyepieces .....	38
<b>Installation site</b> .....	<b>15</b>	Screwing objectives in and out .....	38
<b>Unpacking</b> .....	<b>16</b>	Assembling the stages, the plane stage and object guide .....	38
<b>Installation</b> .....	<b>16</b>	The E version DM IRB/E .....	41

# Contents

<b>Learn mode</b> .....	<b>43</b>	<b>Operation</b>	
Installing the objective prisms .....	43	<b>of transmitted light interference contrast</b> .....	<b>78</b>
Learning the IC objective prisms .....	43	<b>Operation of incident light fluorescence</b> .....	<b>81</b>
Installing the objectives .....	44	<b>Operation of filters</b> .....	<b>88</b>
Parfocality .....	47	<b>Operation of the slide overlay device</b> .....	<b>89</b>
Dry objectives .....	47	<b>Operation of the macro device</b> .....	<b>90</b>
Oil immersion objectives .....	47	<b>Operation of LMC</b> .....	<b>97</b>
Exiting the Learn mode .....	47	<b>Principle of LMC</b> .....	<b>98</b>
Individual user adjustments .....	48	<b>Components</b> .....	<b>99</b>
Installing the fluorescence filter cube .....	49	<b>Assembly/adjustment</b> .....	<b>100</b>
Concluding the installation .....	49	<b>Areas of application</b> .....	<b>102</b>
Motorized objective nosepiece .....	50	<b>Care and maintenance</b> .....	<b>103</b>
<b>Operating modes</b> .....	<b>51</b>	<b>Troubleshooting</b> .....	<b>105</b>
DRY and IMMERSION .....	51	<b>Storage</b> .....	<b>112</b>
Changing the operating mode .....	51	<b>Packaging and transport</b> .....	<b>112</b>
Automatic lowering of the objective nosepiece .....	52	<b>Technical description</b> .....	<b>113</b>
<b>Brightness adjustment</b> .....	<b>53</b>	<b>General technical data</b> .....	<b>125</b>
<b>Electronic focus</b> .....	<b>54</b>	<b>Main wearing and spare parts, tools</b> .....	<b>127</b>
<b>Operation</b> .....	<b>64</b>	<b>EU Conformity declaration</b> .....	<b>128</b>
<b>Basic setting for transmitted light</b> .....	<b>64</b>		
<b>Operation of objectives</b> .....	<b>70</b>		
<b>Operation of transmitted light</b> .....	<b>71</b>		
<b>Operation of phase contrast</b> .....	<b>74</b>		
<b>Operation of transmitted light darkfield</b> .....	<b>76</b>		
<b>Operation of transmitted light polarisation</b> ..	<b>77</b>		

# Important notes on this manual

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

This manual contains important instructions and information on the operating safety and maintenance of the system. It must therefore be kept in a safe place.

The manual is multi-lingual. Due to the spiral binding you can turn the language version you want to the front.

The DM IR is available both as a life sciences microscope and as a metallographic/industrial microscope. In cases where the function and operation are identical, the same text and illustrations are used in both the separate instruction manuals.

## Text symbols and their meaning:

(1.2)

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

→ p. 20

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



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



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



Warning of hot surface.



Explanatory note.



Not part of all configurations.

# General safety information

This instrument of safety class 1 has been built and tested according to EN 61010-1/IEC 1010-1/VDE 0411-1, 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 make the microscope potentially dangerous. Intentional interruption 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 too near a water supply 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!

# Intended application

The new DMIRB is the logical further development of the successful inverted research microscope from Leica. It is used for examinations of cells and tissue, for micromanipulation and microinjection techniques all the way through to microdissection or confocal microscopy. The DMIRB has universal application potential, incorporating all the contrasting techniques of brightfield, darkfield, phase contrast, DIC, fluorescence and Hoffmann modulation contrast, which are all easy to use and switch between. Variable illumination and imaging light paths, HCS optics, modular accessories and a wide range of peripherals make the large DMIRB research microscope from Leica a versatile and powerful product.

# The microscope and its components

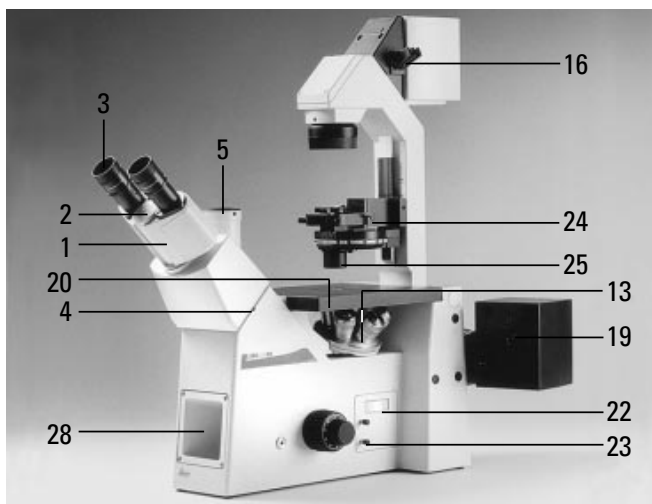
## Key subassemblies

The following views of the whole microscope show and name important subassemblies of the microscope and its accessories.

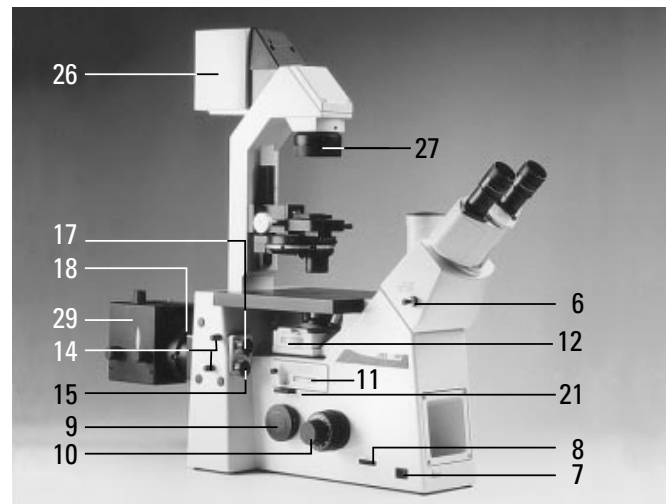
**Fig. 1–2**

**1** Binocular phototube, **2** Eyepiece adapter tube, **3** Eyepieces, **4** Tube mount (tube change interface), **5** Tube port for photo/TV connection, **6** Beamsplitter switch, **7** Mains switch, **8** Brightness adjustment, **9** Lateral TV port, **10** Coaxial coarse and fine drive, **11** Fluorescence module, **12** ICT prism adjustment, **13** Sextuple objective nosepiece, **14** Centring buttons for incident light field diaphragm, **15** Field diaphragm adjustment, **16** Filters, **17** Aperture diaphragm adjustment, **18** Lamphousing mount (or mirrorhousing for two lamphousings), **19** Lamphousing, **20** Stage plate, **21** Analyser, **22** Tube lens module (Bertrand lens and magnification changer), **23** Switch rod for lateral TV port, **24** Transmitted light illumination column, **25** Condenser, **26** Transmitted light lamphousing, **27** Transmitted light field diaphragm, **28** SLR port, **29** Second lamphousing

**Fig. 1** View from the right



**Fig. 2** View from the left



## The stand

There are 5 basic versions of the DM IRB stand, which allow over 50 microscope variants to be configured.

These 5 basic versions are:

- Manual or electronic stand
- With or without integrated fluorescence axis
- With or without SLR front port or bottom port
- Lateral photo port 100 % or 80 %
- With or without integrated magnification changer

The variants and their components, differences and uses will be explained individually in this manual. The function and operation of all microscopy techniques and the necessary accessories for the Leica DM IRB will be described and explained in detail in the **Operation section** of this manual.

**First of all, here is a general overview:**

### Stands

The **basic stand** has a photo port on the left for the adaption of: TV camera, SLR camera or photomicro system. The variants offered send either 100 % or 80 % of the light to this photo port.

Besides the lateral photo port, the **SLR stand** also has another port facing the front (front port\*) which can be equipped with either an SLR camera or a TV camera with c-mount connection.

The **stand with bottom port** cannot be equipped with an SLR front port. This variant is only produced at a customer's specific request.

The **electronic stand** additionally offers a motorised objective nosepiece, electronic focusing, IC objective prism coding, LCD display of microscope functions and (optional) motorised filter cube changer (RF4-mot module) with electric dark flap, control panel, etc. All the above-mentioned stands are also available as **fluorescence stands** with integrated fluorescence axis. All the fluorescence stands (including the manual versions) can be fitted with the RF4-mot module.

### Tube mount

The interface between the stand and the tube is called tube mount or tube change interface.

The tube mount is compatible with DM IR tubes and the IR/R tube adapter which allows the use of DM R tubes.

### Tube

The tube, or its tube lens, produces the primary image together with the objective.

DM IR tubes consist of a basic part, the binocular part and the tube change ring. The trinocular tube also has a photo/TV port. A switchable mirror either directs the light 100 % to the eyepieces or 100 % to the photo port, or splits it 50 %/50 %.

### Brightness adjustment

A 12 V 100 W transformer is built into the stand for stepless regulation of brightness with the brightness control.

### Coarse and fine control

The coarse and fine focus control allows fast and precise focusing of the microscope image. Focusing is done by a vertical movement of the objective nosepiece. The vertical movement range is 9 mm.

### Mains switch

The mains switch is used for switching the microscope power supply on and off.

### Incident light fluorescence device

The variant with incident light fluorescence device contains the integrated fluorescence axis and the lamp mount or a mirrorhousing for adaption of a second lamphousing. The fluorescence stand also comprises the fluorescence module which takes 4 filter cubes. This module is also available as a motorised variant under the name RF4-mot module (see Technical Description).

### Aperture diaphragm

The aperture diaphragm determines the resolution, field depth and contrast of the microscope image. The best resolution is achieved when the apertures of the objectives and the condenser are roughly the same.



**n. b.:**

The aperture diaphragm in the **illumination light path** is not intended for adjusting the brightness of the image. This should only be done by turning the brightness adjustment knob or using the neutral light damping filter.

### Condenser

The condenser is a lens system through which the light is collected and focused on the specimen underneath. The condenser is designed to utilise the numerical aperture of the objective.

### Condenser height adjustment

The markings on the transmitted light illumination column indicate the height settings of the different condensers.

## **Specimen stages and accessories**

The specimen stage supports the specimens that are to be examined through the microscope. Several options are available to accommodate the wide variety of specimens examined, such as object guides, extension plates, specimen clips, scanning stage, heating stage, etc.

## **Objective nosepiece and objectives**

The objective nosepiece is used to hold the objectives. L objectives with long working distances, for example, are specially corrected to respect different thicknesses of vessel bases. All microscope objectives from magnification 2.5x to 100x can be used. All objectives from the DML and DMR range with 25 mm thread are compatible. The performance data of Leica objectives can be found in the chapter "Technical Data; Performance Data" or on the relevant objective lists available from your Leica agency.

## **IR/R tube adapter**

The tube adapter is used to adapt tubes from the DM R range.

## **Eyepieces**

A magnified, virtual image of the actual intermediate image produced by the objective is produced with the eyepieces. They act as a magnifier.

## **Transmitted light illumination unit**

The transmitted light illumination unit consists of the lamphousing and the transmitted light illumination column. The transmitted light lamphousing comprises a precentred 12 V 100 W halogen lamp and a filter module for three swing-in filters.

## **Field diaphragm**

The field diaphragm is used to produce Koehler illumination.

## **Lamphousings**

A variety of lamphousings are offered for the DM IRB (for halogen, mercury or xenon lamps). The description and area of application can be found in the operation section of this manual.

## **Filters**

Filters are generally used to enhance the contrast of the specimen and are assembled in the illumination column. A variety of different filters are easily changed.

# Installation site

The microscope should be used in a dust-free room which is free of oil and chemical fumes and extreme humidity. Also, the workplace should not be exposed to major temperature fluctuations, direct sunlight or vibrations. These may impair measurements or photographs of the microscope image.

## Ambient conditions:

Temperature	10–36 °C
Relative humidity	0–80 % to 30 °C

Microscopes in warm and humid climates need special care to prevent build-up of fungus. Further details are given in the chapters “Maintenance” and “Storage”.



**n. b.:**

Lamphousings\* and power units\* must be placed at least 10 cm away from the wall and from flammable objects.

# 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.:**

Keep the packing material for storage and transport of the microscope and its accessories.



**n. b.:**

Try to avoid touching the lens surfaces of the optics. Any fingermarks on the glass surfaces should be removed with a soft leather or linen cloth. Even small amounts of finger perspiration can attack the surfaces of optical instruments within a short time. Further information is given in the Maintenance and Cleaning chapters.

# Installation

- First take all the components out of the transport and packing material.
- Put the basic DM IRB stand on a desk which has enough room for it.



**n. b.:**

On no account should the microscope be connected to the power socket yet!



# Assembly

## 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.

## Assembly of the transmitted light illumination column

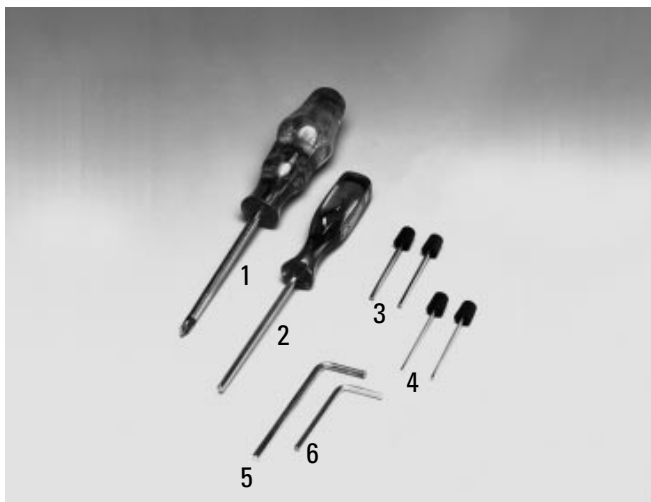
Wipe off the interface surface (4.3) with a dry cloth. Tilt the illumination column (4.1) slightly to the back and insert so that the pin (4.2) engages in the groove of the interface surface (4.4).

Erect the TL illumination column and secure with the 4 screws.

When screwing on the TL illumination column, do not hold onto it so that optimal alignment to the optical axis is guaranteed. The angle of tilt of the illumination column can be varied or clamped securely in the vertical position with the knurled screw (5.1).

**Fig. 3** 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)



The lamphousing for transmitted light illumination for 12V 100W halogen lamps with single-lens aspherical collector and heat protection filter is an integral part of the transmitted light illumination column. The halogen lamp is preassembled. The chapter on Troubleshooting includes a description of how to assemble and change halogen lamps.

The cable on the illumination column can then be connected to the 12V 100W socket on the back of the microscope stand.

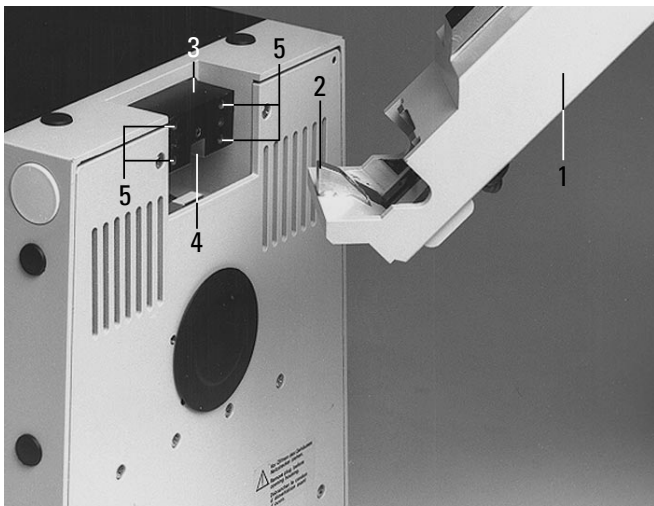
## Assembly of condensers

The technical description of the condensers can be found in the chapter "Technical description". All condensers of the Leica DM IRB are equipped with a 6-position rotating disc (6.2 and 8.3) and can be individually fitted with the corresponding annular diaphragms for phase contrast (PH), darkfield (DF) or IC prisms for TL interference contrast (ICT) (10).

Usually the annular diaphragms are already inserted in the condenser disc in the factory, so you will not normally have to fit them yourself. The condenser disc (11.5) is removed from the condenser by slackening the screw (11.4) on the underneath of the condenser.

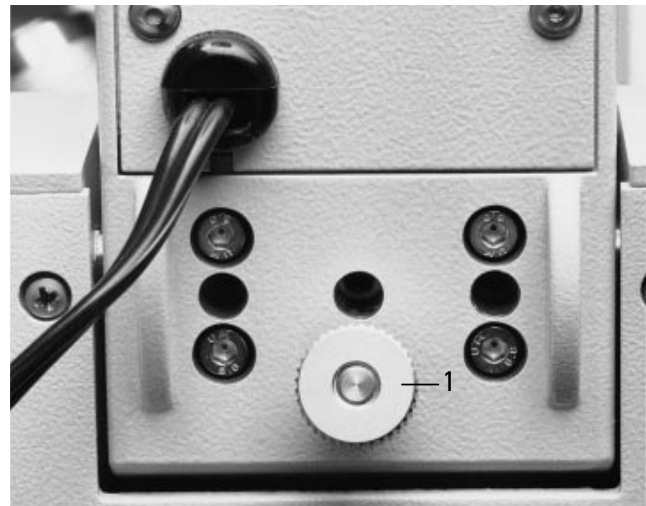
**Fig. 4** Assembly of transmitted light illumination column

**1** Transmitted light illumination column, **2** Pin of TL illumination column, **3** Support surface, **4** Groove of support surface, **5** Drill holes for fixing screws



**Fig. 5** Transmitted light illumination column, back view

**1** Knurled screw for clamping the transmitted light illumination column



Insert the light rings for Phaco (identified by the code numbers 0, 1, 2, 3 and the intercept distance  $S$  of the corresponding condenser top, e.g. 2 S1) and the DF diaphragm (identified by  $D$  for darkfield and the intercept distance  $S$  of the corresponding condenser top, e.g. D S1, see table "Technical Description") in the slots of the disc as follows:

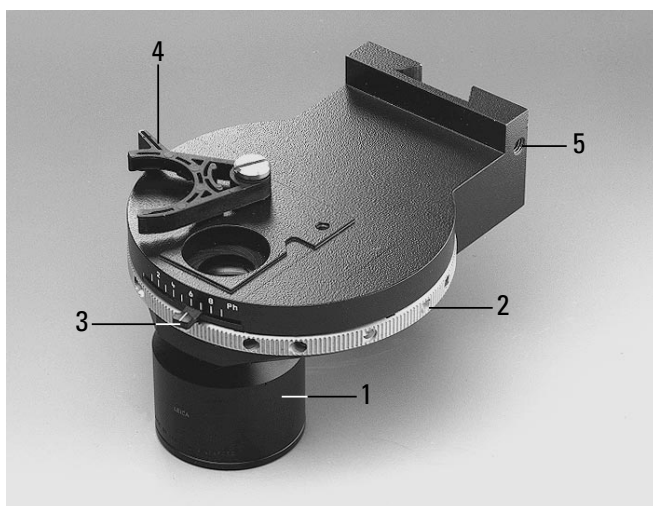
- Slightly unscrew the two centring screws (10.11) using the supplied centring key (12.1).
- Insert the diaphragms so that the mount fits under the spring (10.3) of the slot.
- When the light rings are assembled, their identification code must be visible i.e. pointing upwards (12.3, 12.4 and 12.5).
- Insert the light rings in the order 0, 1, 2, 3. The DF diaphragm can only be inserted in a large hole.

- Using the centring keys, screw the centring screws back in until they no longer protrude over the outer edge of the disc.
- Fit IC condenser prisms if appropriate (see assembly of ICT objective prisms).
- Insert the plastic labels (10.7) in the disc (12.2), allocating them to the corresponding diaphragms.
- Mark any empty holes with white labels.

Insert the disc into the condenser with notches (10.6) facing upwards – towards the aperture diaphragm (6.3 and 8.4) – and screw down (11.4).

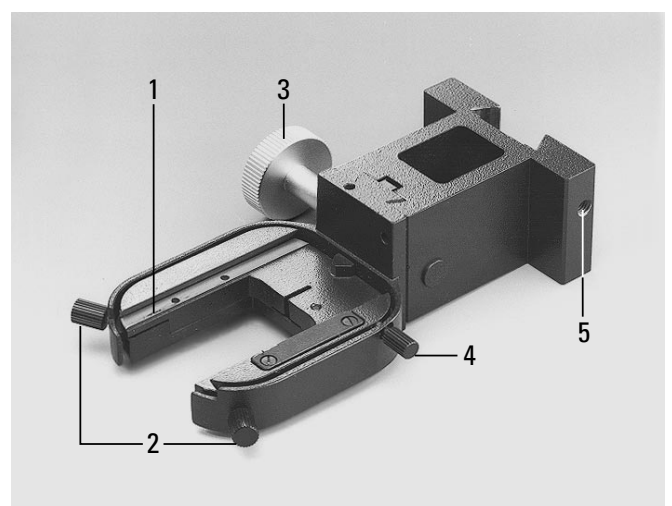
**Fig. 6** Condenser 0.30 S70

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



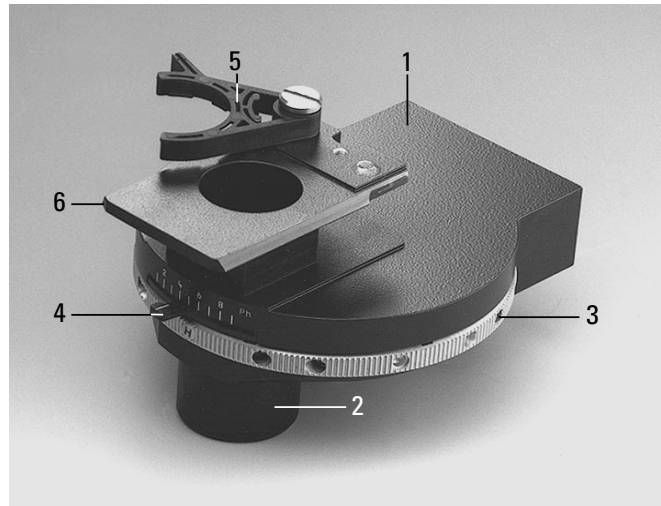
**Fig. 7** Condenser holder

1 Condenser slide changer, 2 Condenser centring screws, 3 Condenser height adjustment, 4 Condenser clamp screw, 5 Screw for clamping the condenser holder



**Fig. 8** 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



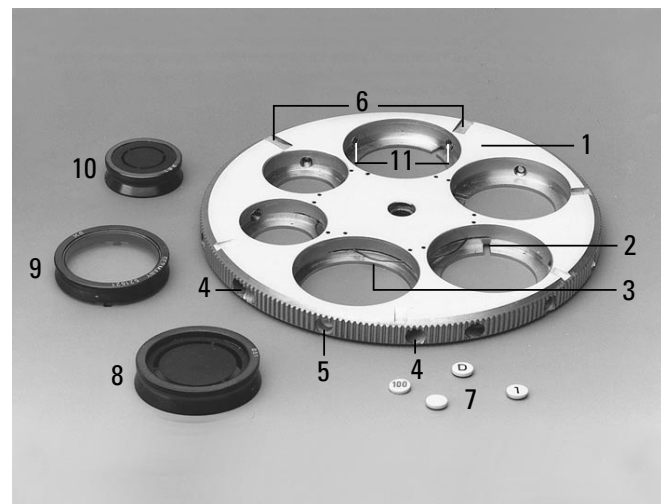
**Fig. 9** Condenser tops for condenser base (8.1)

**1** Condenser top 0.53 S23, **2** Condenser top 0.90 S1, **3** Condenser top P 1.40 OIL S1, **4** Spacer ring for assembling 9.2 and 9.3



**Fig. 10** 6-position condenser disc, empty

**1** Condenser disc with slots for light rings and IC condenser prisms, **2** Guide groove for IC condenser prisms (2<sup>nd</sup> groove is concealed), **3** Spring, **4** Holes for centring keys, **5** Spaces for label plates, **6** Notches, **7** Label plates, **8** Light ring for darkfield, **9** IC condenser prism with 2 guide cams, **10** Light ring for phase contrast, **11** Centring screws



## Assembly of IC condenser prisms

The IC condenser prisms are assembled at the factory. The following steps are only necessary in case of a retrofit:

Remove the condenser disc (11.5) by slackening the screw (11.4) on the underneath of the condenser.

- Using the centring keys (12.1), slightly unscrew the two centring screws (10.11).
- IC condenser prisms can only be inserted into the large holes of the condenser disc which have guide grooves (10.2).
- Insert the IC condenser prisms in ascending order, e.g. K1, K2 and so that the mount fits under the spring (10.3) in the slot and the 2 guide cams engage in the grooves of the condenser disc (10.2).
- When the prisms are inserted, their identification code, e.g. K10, must be visible and pointing towards the centre of the disc (12.6 and 12.7).

- Using the centring keys, screw the centring screws back in until they no longer protrude over the outer edge of the disc. The prism is adjusted with the left centring screw only (see operation of ICT). The right centring screw must never restrict the adjustment range.
- Assemble the light rings and DF diaphragm if appropriate (see previous section).
- Insert the label plates (10.7) corresponding to the relevant IC condenser prism.
- Mark any empty holes with white labels.
- Remove any finger marks or dust on the prisms carefully.
- Put the condenser disc back in the condenser with the notches (10.6) facing upwards – towards the aperture diaphragm (6.3 and 8.4). Screw down the disc (11.4).

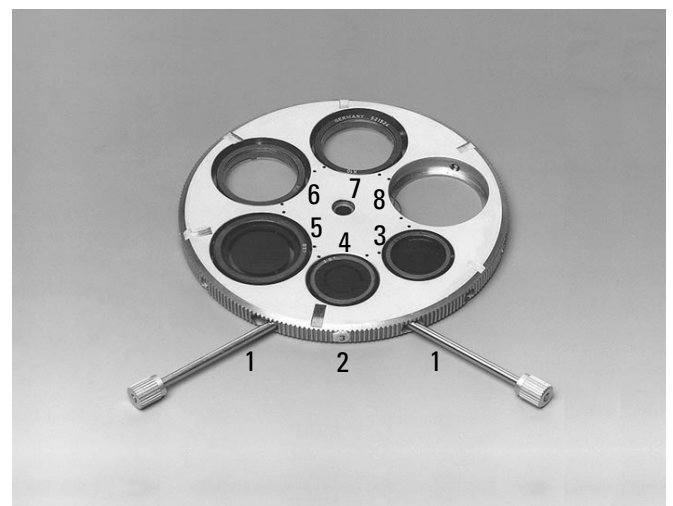
**Fig. 11** Condenser 0.90 S1 (bottom up)

**1** Condenser base, **2** Condenser top 0.90 S1, **3** Spacer ring, **4** Fixing screw for condenser disc, **5** Condenser disc



**Fig. 12** 6-position condenser disc, fully equipped

**1** Centring keys for centring screws (in working position), **2** Label plates, **3, 4** Light rings for phase contrast, **5** Light ring for darkfield, **6, 7** IC condenser prisms, **8** Hole for brightfield



## Condenser top

The base and top of condenser 0.30 S70 form a self-contained unit (Fig. 6).

The condenser top 0.30 S70 (13.4) cannot be used with the condenser base (8.1).

The condenser top 0.53 S23 (8.2 and 9.1) is screwed straight on to the condenser base (8.1). A spacer ring (9.4 and 11.3) must be used for assembling the condenser tops 0.90 S1 and P 1.40 OIL S1 (9.2 and 9.3).

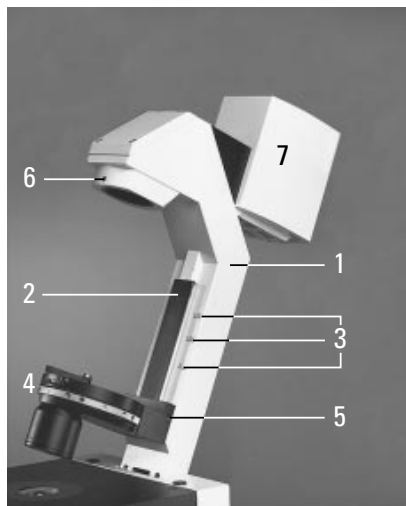
## Assembly of the condensers to the illumination column

### Condenser 0.30 S70

Tilt the TL illumination column to the back (13.1). Insert the condenser 0.30 S70 (13.4) from below into the dovetail guide of the illumination column (13.2), with the condenser top pointing towards the microscope stage. Adjust the height of the condenser until its upper edge is flush with the condenser height marking S70 on the illumination column. Secure the condenser with the supplied hexagonal screwdriver. Erect the TL illumination column.

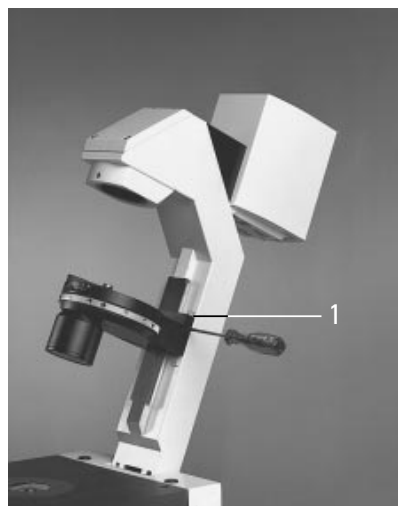
**Fig. 13** Assembly of condenser 0.30 S70

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



**Fig. 14** Assembly of condenser 0.30 S70

**1** Condenser 0.30 S70 in working position (upper edge of condenser is flush with condenser height marking S70)

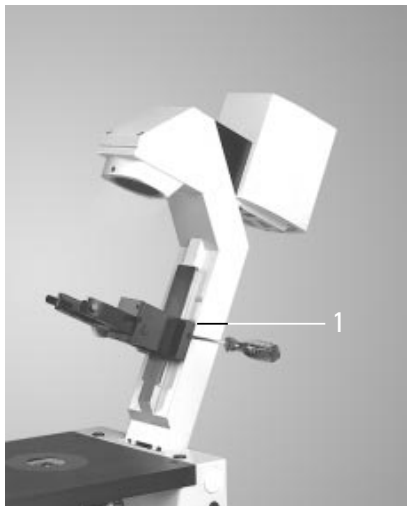


## Condensers 0.53 S23 and 0.90 S1

With the illumination column tilted to the back, insert the condenser holder (15.4) into the dovetail guide of the illumination column from below (15.2). 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 (16.1), depending on the condenser top used. Secure the condenser holder with the hexagonal screwdriver and clamp screw (15.5). Mount the base part of the condenser with the dovetail guide (8.6) to the slide change mechanism (7.1) of the condenser holder (17). The condenser top should point downwards and the aperture diaphragm control towards the front (17.3). Slacken the clamp screw (17.5) and push the condenser back as far as the stop. Retighten the clamp screw (17.5) slightly.

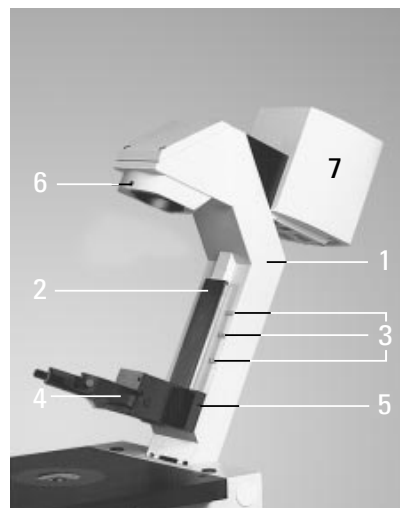
**Fig. 16** Assembly of condenser holder

**1** Condenser holder in working position for condenser 0.53 S23 (upper edge of condenser holder coincides with condenser height marking S23)



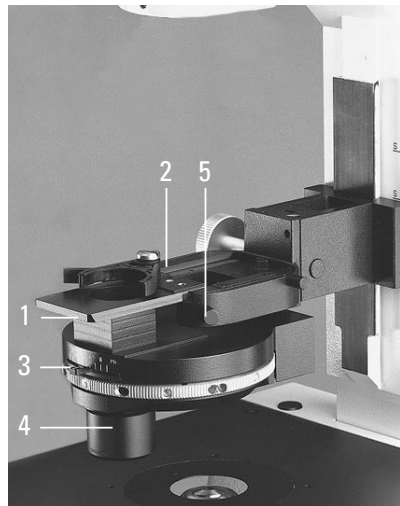
**Fig. 15** Assembly of condenser holder

**1** Transmitted light illumination column, **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. 17** Assembly of 0.53 S23 condenser

**1** Dovetail guide of the condenser, **2** Sliding condenser changer, **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 (18.1) into the mount (Fig. 18) from below. The diaphragm adjustment (18.2) should point in the direction of the tube. Secure with clamp screw (18.3).

**Fig. 18** Assembly of field diaphragm

**1** Field diaphragm module, **2** Field diaphragm adjustment, **3** Clamp screw for securing the field diaphragm module



**Fig. 19** Assembly of filters

**1** Clamp screw for securing the filter holder



## Assembly of filters and filter holder

The Leica DM IRB 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. 19.1) and remove the filter holder.
- Put the filters into the holder (20).
- Mount the filter holder onto the transmitted light illumination column and secure in position with the clamp screws.

**Fig. 20** Assembly of filter holder for 3 filters



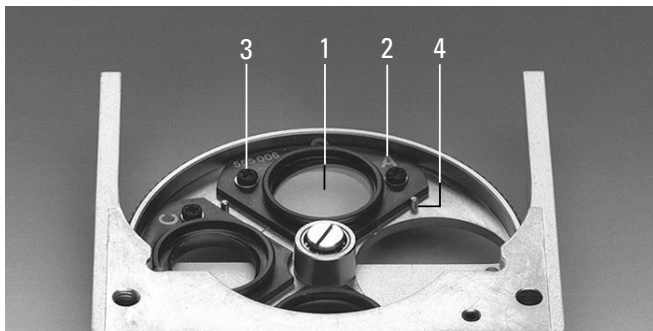


## Assembling the ICT objective prisms

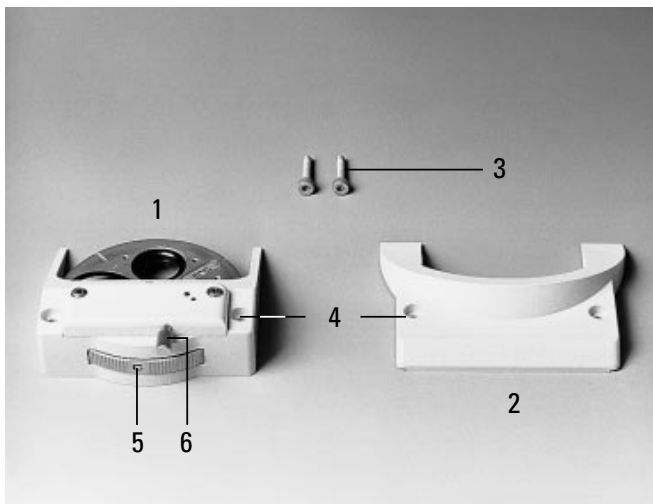
### Assembling the IC module and IC objective prisms

The IC prism disc with the IC prisms ordered by the customer are already assembled in the microscope at the factory. In case you want to retrofit the IC prism disc, please proceed as follows:

**Fig. 21** IC objective prism disc without fixing knurl  
1 IC objective prism in mount, 2 Code letter (e. g. A), 3 Washer and screw, 4 Stop pin



**Fig. 22** Assembly of IC objective prism module  
1 IC objective prism module, 2 Cover, 3 Fixing screw, 4 Hole for fixing screws, 5 Label plates, 6 Knurled fixing knob



Remove the front cover (22.2) under the objective nosepiece (23.1) after slackening the Allen screws (22.4).

Insert the IC prism disc (22.1) in the mount and tighten with the two Allen screws. n. b.: insert the prism disc with the prism mount pointing downwards.

### Retrofitting individual IC prisms:

Please align prisms against the stop pin (21.4) and only screw down lightly to avoid strain. Insert the prisms so that the code letter, e. g. A points upwards and is readable.

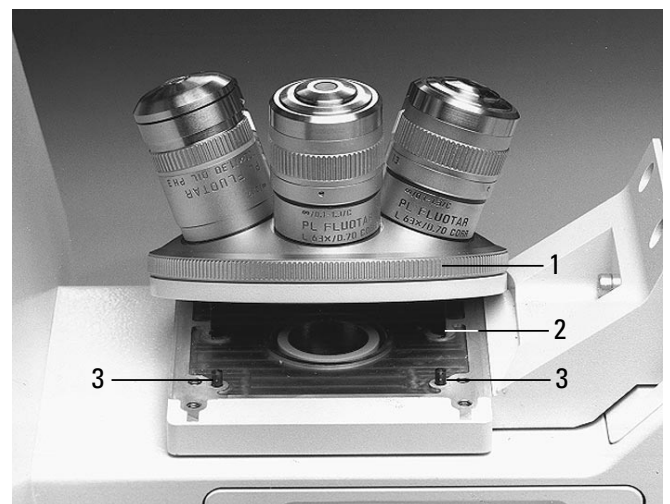
Label the position of the prism on the front of the ICR prism disc with a label plate (22.5).

### Examples of prisms:

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.

**Abb. 23** Assembly of IC objective prism module  
1 Objective nosepiece, 2 Mount for IC objective prism module, 3 Stop pins



## 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.

## Inserting the analyser

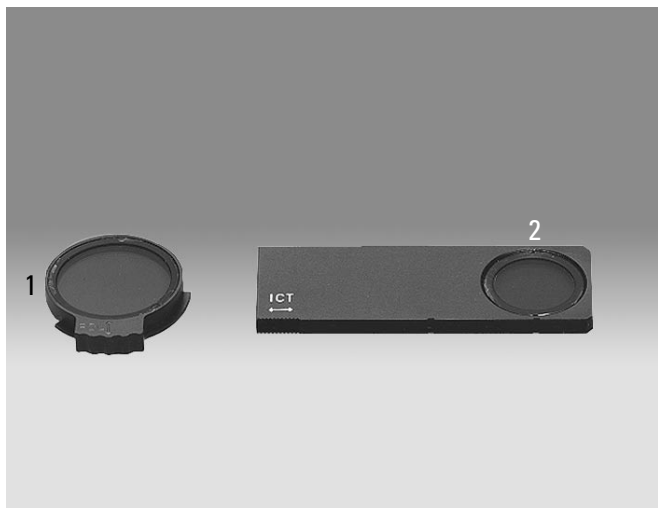
Remove the blind slide and insert the analyser (24.2) from the left as far as the 1<sup>st</sup> clickstop.

## Inserting the polariser

The polariser is inserted into the filter holder of the condenser. In addition a whole-wave compensator is applied to the back of the polariser. It is activated by turning the polariser over, in order to enable colour contrasting in polarisation or interference contrast (the compensator is active when the lambda symbol  $\lambda$  is visible from above).

**Fig. 24** Polariser/analyser

1 Polariser POL  $\updownarrow$ , 2 Analyser ICT  $\leftrightarrow$



**Fig. 25** Condenser 0.53 S23

1 Filter holder with polariser inserted (swung out)



## Inserting the fluorescence module

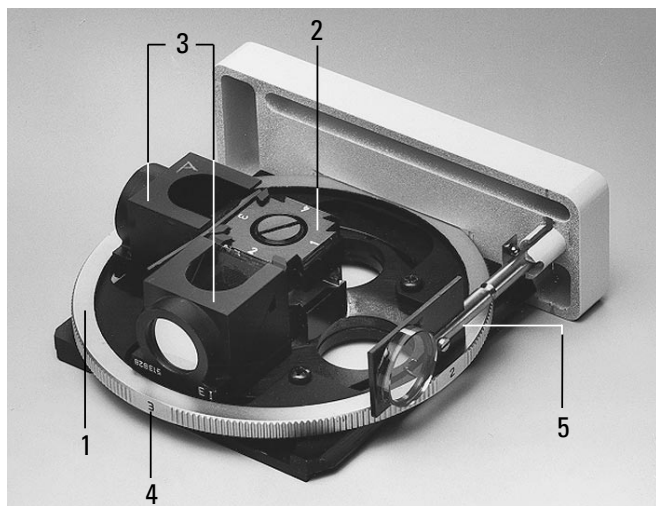
The fluorescence module (Fig. 26) is part of the fluorescence stand, but is also available as a retrofit kit. To retrofit the fluorescence module, remove the blind cover from the stand. The fluorescence module can be fitted with up to four different filter cubes (26.3). They are inserted into the dovetail mount (26.2) of the fluorescence module with their engraving facing downwards (towards the turret plate). The fluorescence module is inserted on a dovetail guide into its slot on the stand by pushing it as far as the stop. One part of the fluorescence module is the anti-glare protection (27.1), which can be inserted between the tube and the stage. Proceed in the same way if you are inserting a motorised filter cube changer instead of the manual filter module. Also read the manual for the electronic version.

## Assembly of the lamp mount, mirror housing, lamphousing, illumination telescope

1. Insert the lamp mount or mirror housing in the back panel and screw down with Allen screws. Engage the guide pin of the lamp mount (29.1) in the back panel of the microscope stand (28.2).
2. Hold the lamphousings 107/2, 107, 106z against the lamphousing mount and secure with the fixing screw (Fig. 31).
3. We recommend using the illumination telescope for gas discharge lamps. This is inserted between the lamp mount and the lamphousing 106z (30.4) 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 a significantly higher illumination intensity for fluorescence.

**Fig. 26** Fluorescence module

**1** Rotatable turret, **2, 4** Dovetail mounts for filter cubes (the numbers 1–4 are markings of the assembly positions), **3** Filter cubes, **4** Display of the position in the light path, **5** Switch rod with BG 38 and light stop



**Fig. 27** Anti-glare protection



4. Connect the lamp plug to the connecting socket in the stand (28.3).
5. Insert light filters, 50 mm Ø into the 2 spaces in the lamphousing mounts (29.4).

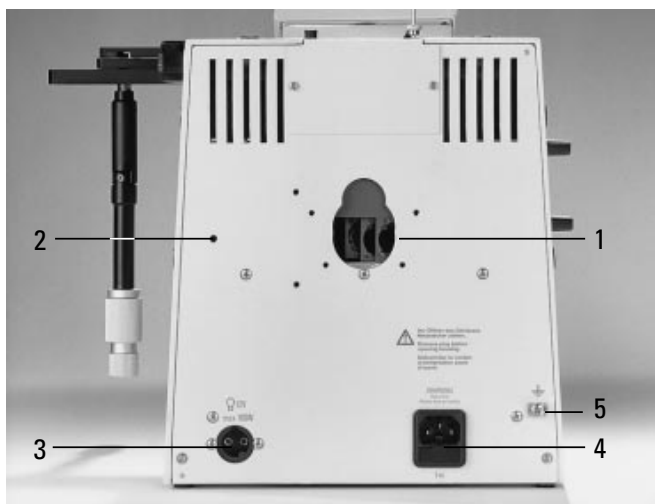


**n. b.:**

Connect the appliance cable to the mains socket on the microscope stand (28.4)!

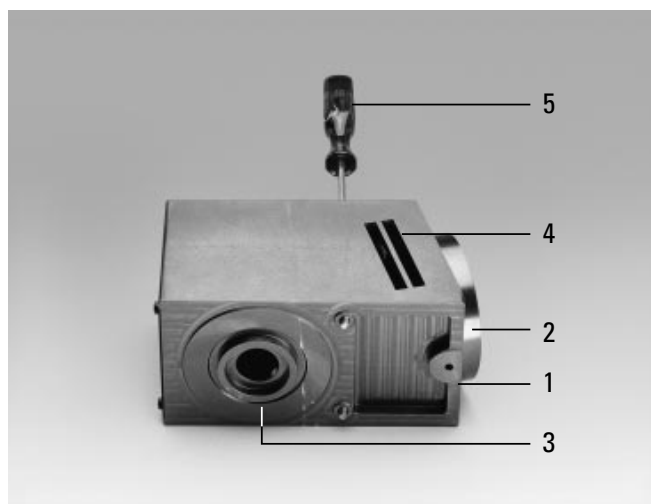
**Fig. 28** Back view of microscope

1 Space for assembling a lamphousing mount or mirror housing, 2 Hole for guide pin, 3 Socket for lamp plug, 4 Mains socket, 5 Potential equalisation



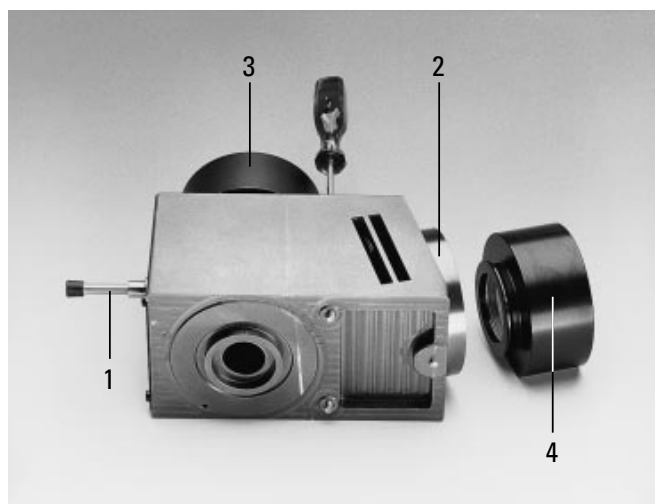
**Fig. 29** Lamp mount

1 Guide pin, 2 Lateral lamphousing mount, 3 Dovetail ring for mounting to stand, 4 2 spaces for light filters, 5 Allen screws for fixing



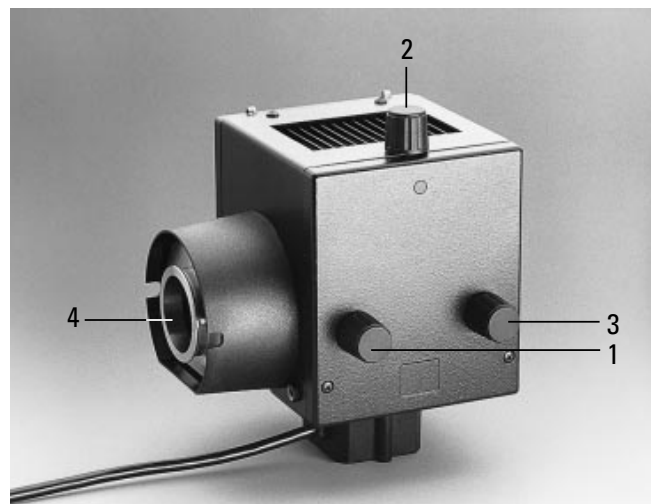
**Fig. 30** Mirror housing and illumination telescope

1 Lever for mirror switching, 2 Lateral lamphousing mount with fixing screw, 3 Back lamphousing mount with Allen screw, 4 Illumination telescope for gas discharge lamps



**Fig. 31** Lamphousing 106 z L

1 Collector adjustment, 2 Vertical lamp adjustment, 3 Horizontal lamp adjustment, 4 Mount ring



## Assembling and exchanging incident light lamps

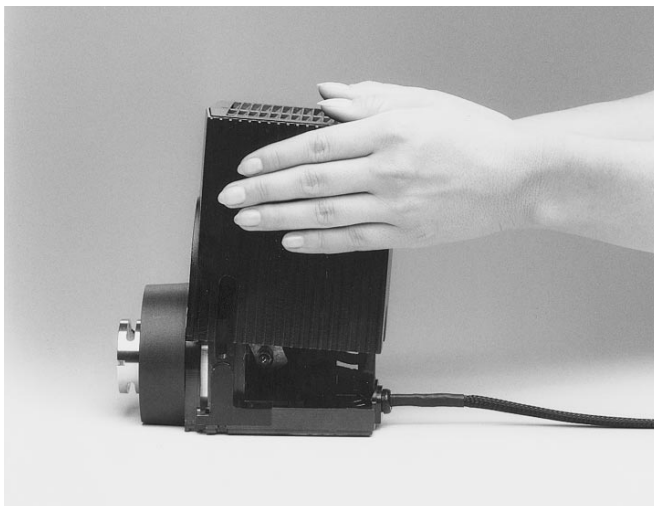
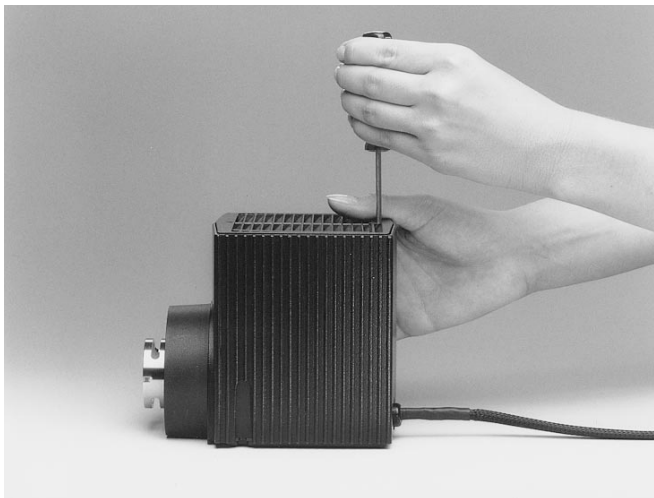
### Exchanging the 12 V 100 W halogen lamp:



**n. b.:**

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

**Fig. 32a–c** Lamphousing 107 L  
1 Mount with halogen lamp, 2 Collector



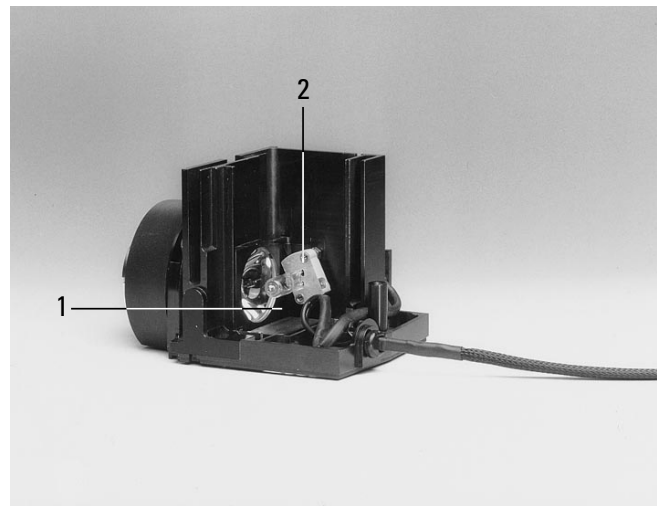
## Lamphousing 107 L

Slacken the fixing screw on the cover and lift off the cover (Fig. 32a and 32b). Move the collector to the front and pull the defect 12 V 100 W lamp out of the base towards the front. 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.



## Lamphousing 106 z L

Slacken the fixing screw on the lid (33.10). Pull the cut-out plug slightly out of the socket and flip up lid (33.11; 33.1).

Move the collector to the front and lift the defect lamp out of the base (33.1; 33.2; 33.3). For convenience, the lamp holder can be removed from the lamphousing as well. To do this, slacken the fixing screws on the lamp holder (33.10) and pull out lamp holder (Fig. 34).

Without removing its protective cover, put a new lamp into the base, without tilting, as far as it will go.

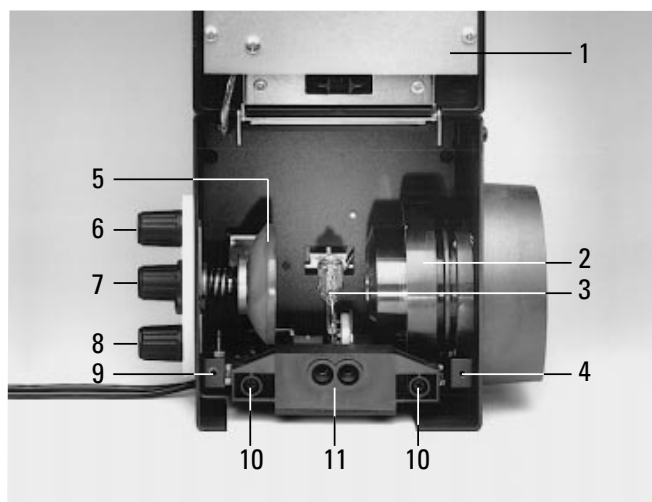


**n. b.:**

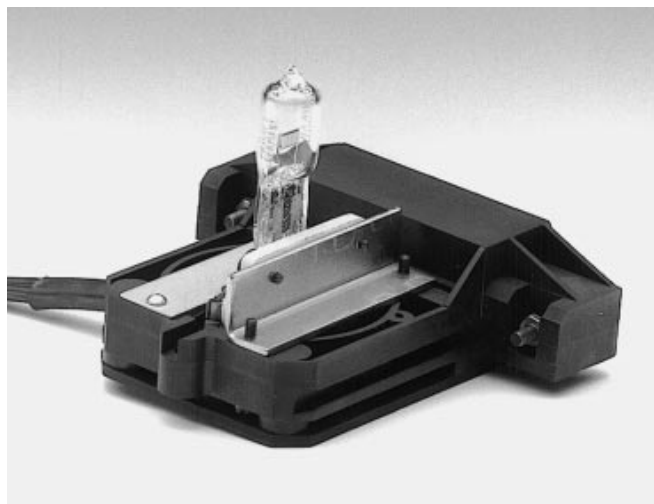
It is important to leave the protective cover on the lamp until it is in position. Avoid making finger marks or wipe off immediately. Close the lamphousing.

**Fig. 33** Lamphousing 106 z L

**1** Lid, flipped up, **2** Collector, **3** 12 V 100 W halogen lamp or gas discharge lamp in holder, **4, 9** Cover fixing screws, **5** Reflector, **6, 7, 8** x-y adjustment screw for reflector, **10** Fixing screws for lamp mount, **11** Socket for contact plug



**Fig. 34** 12 V 100 W lamp holder with halogen lamp



## Assembling and exchanging 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.

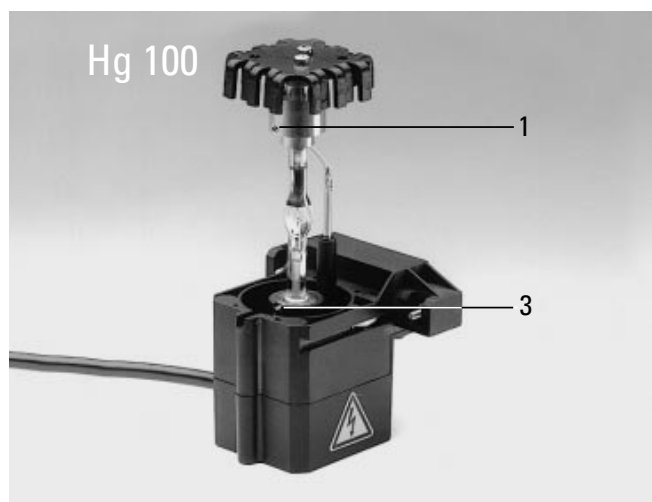
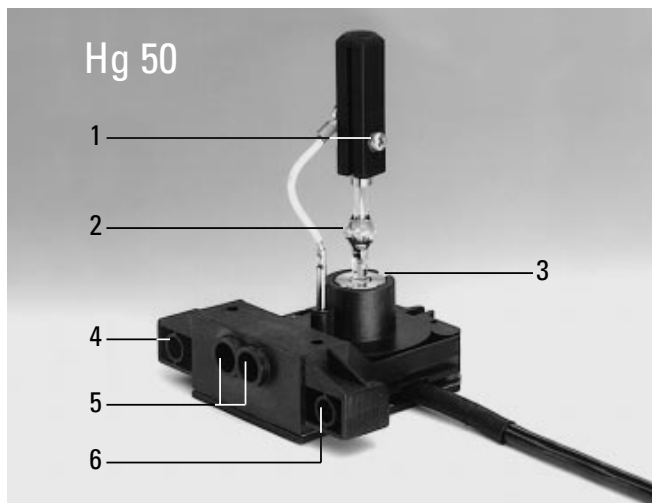
## Lamphousing 106 z L

Besides the halogen lamp, the following gas discharge lamps can be used, which each require different lamp holders (Fig. 35) 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. stabilised)	400 h
Hg ultra high pressure lamp	100 W (D.C. stabilised/non-stabilised)	200 h
Hg ultra high pressure lamp	100 W (D.C. stabilised/non-stabilised, type 103 W/2)	300 h

**Fig. 35** Lamp holders for gas discharge lamps

1 Upper clamp, 2 Seal point of the burner, 3 Lower clamp, 4, 6 Lamp holder screws, 5 Socket for cut-out plug, 7 Protective cover





n. b.:

**It is extremely important to heed the following advice!**

Always disconnect the power unit from the mains before assembling the lamphousing 106 z.

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.

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.

The LH 106 z L is opened by undoing the fixing screws on the lid (11.10).

Pull the cut-out plug slightly out of its socket and flip up lid (11.11, 11.1).

Always insert the burner so that



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).

2. if the bulb has a seal point (Fig. 35), the burner is turned so that this point will be **at the side**, not in the light path.

Put the upper pin of the burner between the clamps of the flexible power supply and clamp with screw (33.5).

Unscrew the stud (35.3) in the holder slightly, insert the lower end of the metal base and retighten the stud.

To exchange the collector on the lamphousing 106 z:

Using the focusing knob (36.1), move the collector to the rearmost position. Pull the focusing knob of the collector outwards so that the collector can be removed.



n. b.:

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 (36.1).



**n. b.:**

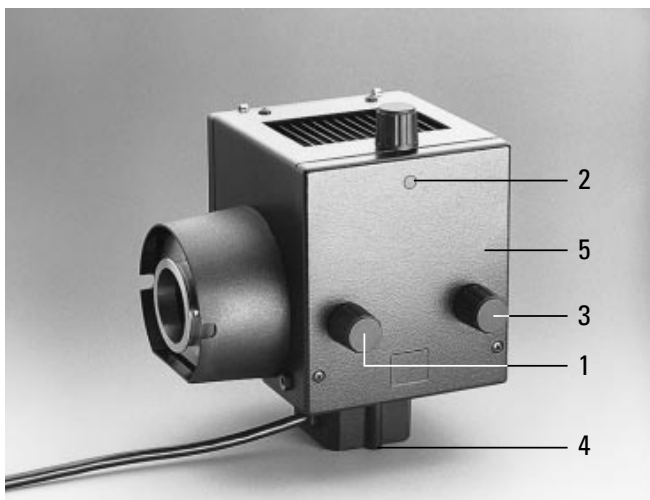
Remove the protective cover from the burner.

Put the lamp holder with burner inserted into the lamphousing and secure with the screws (10.10). Try moving the collector (36.1): 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 (35.11). 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!).

Adjust the burner **immediately** after ignition.

**Fig. 36** Lamphousing 106 z L with Hg 100 W lamp  
1 Collector focusing, 2 Lamp adjustment, vertical, 3 Lamp adjustment, horizontal, 4 Lamp holder Hg, 5 Reflector adjustment (not visible)



## Assembly of the tubes and tube adapter IR/R

Using a screwdriver, slacken the clamp screw (37.1; 38.1; 39.1) on the side of the tube change mount on the stand, mount the tube or tube adapter IR/R (clamp screw points to the right) and align with edges parallel to the microscope (the Siedentopf binocular points upwards in a V shape). The guide pin in the tube mount of the stand must fit into the groove of the tube change interface or interface of the tube adapter IR/R. Retighten the clamp screw. The procedure is the same for mounting the tube on the IR/R adapter. Similarly, the DM R tubes can be connected via this adapter, e. g. the binocular observation and photo tube HC FSA 25 PE (41.1), viewing angle 30°.

With side port for reflecting measurement scales and  $\mu$  marks into the microscope image (slide overlay) and for connecting the MACRODUAL ZOOM 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 IRB.

The tube adapter IR HC is mounted on the tube change mount of the stand and stabilised by tightening the clamp screw.



**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.



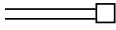
The following tubes from the Leica DMR range are also adaptable:

**Bino HC BSA 25 (42.1)**

**Trino HC FSA 25 P and PR (42.2)**

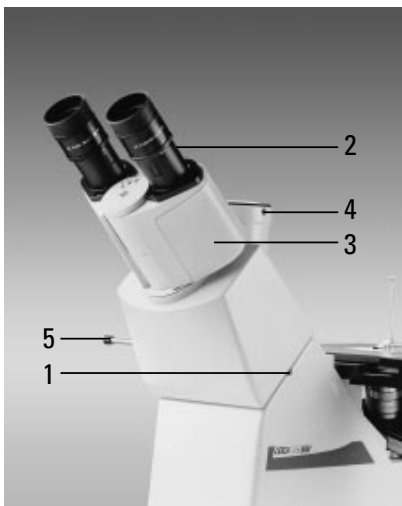
(P + PR = with and without back reflection)

**Fig. 38** HCI 3T 22 trinocular tube with 45° viewing angle

Light path: 100 % vis – switch rod   
 50 % – 50 % – switch rod   
 100 % – photo – switch 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

**1** Clamp screw, **2** Eyepiece port, **3** Siedentopf binocular part, **4** Photo/TV exit, **5** Switch rod



**Photo port for 1 photo/TV connection (43.2)**

**Photo port for 2 photo/TV connections (43.1)**

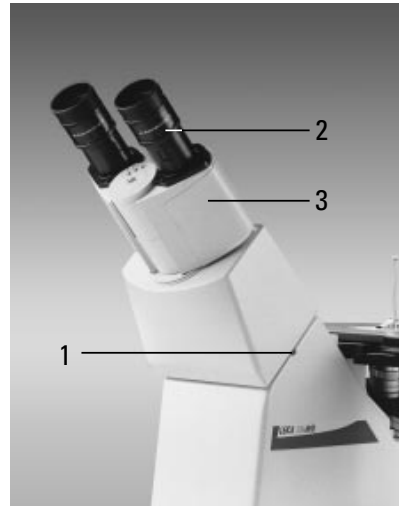
Switchable 100 %/100 % (25.3)

All Leica DMR trinocular tubes have the following beamsplitting system:

100 % vis., 100 % photo or 50 %/50 %.

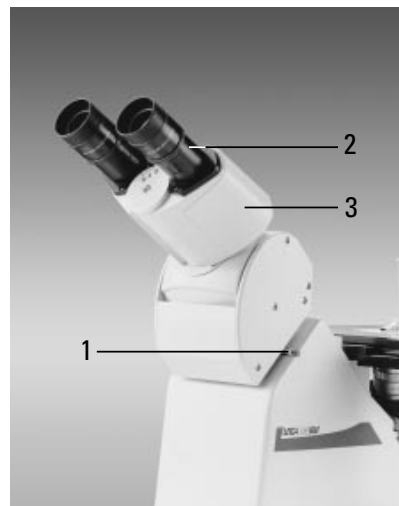
**Fig. 37** HCI B22, binocular tube with 45° viewing angle, field of view up to 22 mm, eyepiece diameter 30 mm for HC PLAN 10x/20 or 22 eyepieces, interpupillary distance setting: 55 – 75 mm

**1** Clamp screw, **2** Eyepiece port, **3** Siedentopf binocular part



**Fig. 39** HCI BV22, 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

**1** Clamp screw, **2** Eyepiece port, **3** Siedentopf binocular part



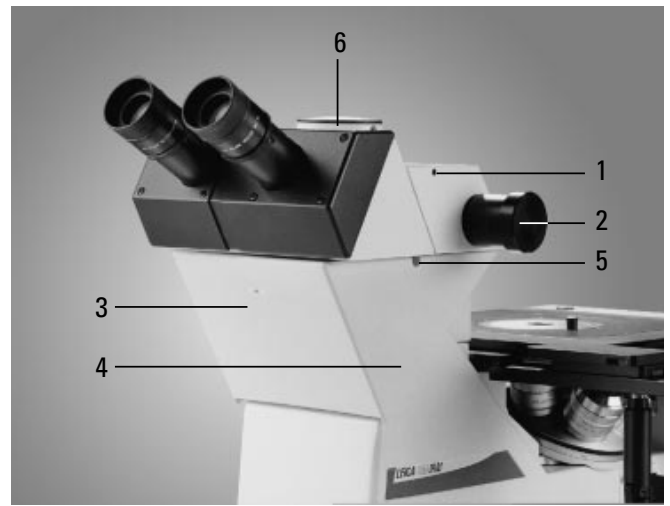
**Fig. 40**

1 Tube adapter R/IR HC, 2 Clamp screw



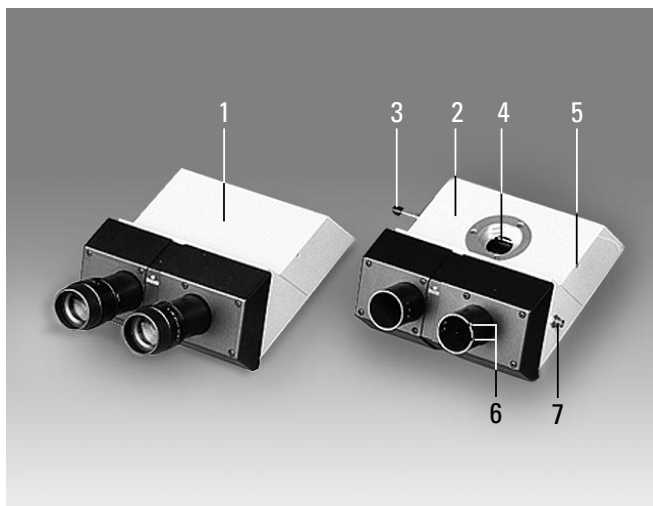
**Fig. 41** Tubes from the DMR range

1 HC FSA 25 PE, 2 Side port for optical overlay, 3 Tube adapter IR HC, 4 Clamp screw for mounting the adapter to the stand, 5 Clamp screw for mounting the tube to the adapter, 6 Photo/TV port



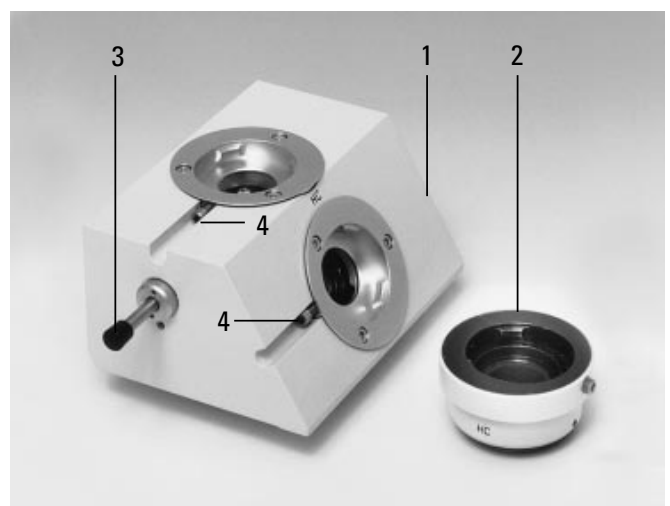
**Fig. 42** Leica DMR HC tubes

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)



**Fig. 43** Photo adapter tube

1 Photo adapter tube with 2 exits, 2 Photo adapter tube with 1 exit, 3 100% ↑ / 100% switch rod, 4 Clamp screw



## Adaption of the slide overlay device and the macro dual system

With the Leica DM IRB inverted microscope, the slide overlay and macro devices can only be adapted onto the FSA 25 PE tube.

This tube has a side flange (44.1) for mounting the reflection optics. These reflection optics are used for mechanical and optical adaption of the slide overlay device and the macro dual zoom system.

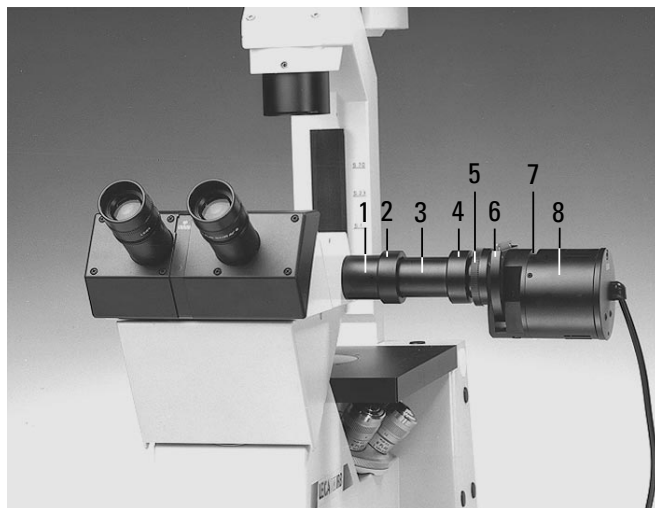
The slide overlay device consists of the reflection optics (44.2), the illumination unit with 6 V 4 W halogen lamp (44.8), the standard 5 x 5 cm slide holder (44.6) and the control (44.5) for focusing the slides. The halogen lamp is powered by a separate transformer (Fig. 45). Mount the reflection optics (44.3) onto the tube flange (44.1) with the coupling ring (44.2), ensuring that the guide pin engages in the groove, and screw down. In the same way, screw the slide overlay device with coupling ring to the reflection optics, again watching the position of the guide pin.

**Fig. 45** Transformer



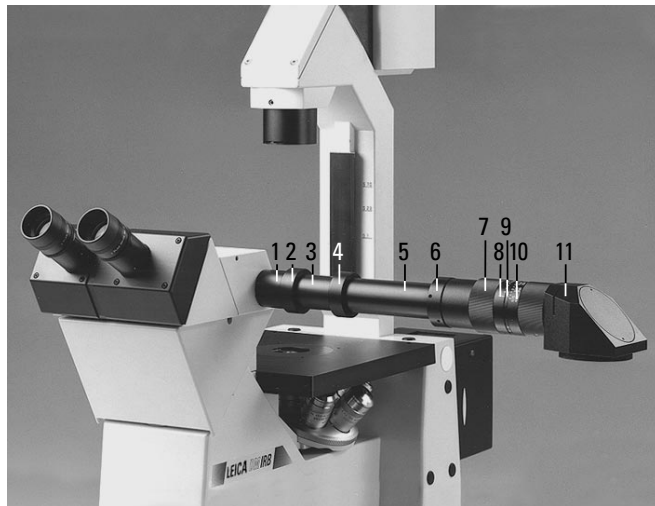
**Fig. 44** Slide overlay device on the FSA 25 PE tube (with tube adapter/45)

**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 adapter tube of lamphousing



**Fig. 46** Macro device on FSA 25 PE tube with tube adapter/45

**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



Screw the reflection optics (46.3) to the tube flange with the coupling ring (46.2). Align the macro adapter (46.5) to the macro dual zoom and secure with the screw ring (46.6). Screw the macro adapter and macro dual zoom to the reflection optics with the coupling ring. Check that the guide pin engages in the groove.

### Inserting the eyepieces

The eyepieces are inserted into the eyepiece tubes.

Use the following eyepieces only:

HC PLAN 10x/20  
HC PLAN 10x/20 M  
HC PLAN 10x/22  
HC PLAN 10x/22 M  
HC PLAN 12.5x/16 M  
Widefield 16x/14 B (M)  
Widefield 25x/9.5 B (M)

(a spacer ring is required for the widefield objectives)

Information on the diameter, the visible area of the specimen and the total magnification of the microscope can be found in the chapter "Technical data; performance data".

### Inserting graticules\*

You can retrofit graticules yourself to the HC PLAN eyepieces in the above list.

Graticules can only be inserted in eyepieces with an adjustable eyelens = M type. The second eyepiece should be an M type as well.



### Important!

Be very careful to keep the optical surfaces clean. Any dust particles and finger marks will show up in the image.

The graticule diameter for all HC PLAN eyepieces is 26 mm.

#### Eyepieces 10x/20 M and 12.5/16 M only:

- Screw the retaining sleeve out of the underneath of the eyepiece.
- Insert the graticule with the coated side facing downwards (towards the objective). If there is any lettering on the graticule it must be imaged the right way round when viewed in the later observation direction.
- Screw the retaining sleeve back in.

#### Eyepieces 10x/22 M only:

- Screw out the underneath of the eyepiece.
- Remove the retainer ring inside it with a blunt blade.
- Insert the graticule with the coated side facing downwards (towards the objective). If there is any lettering on the graticule it must be imaged the right way round when viewed in the later observation direction.
- Screw the retainer ring back in.

## Inserting the photoeyepieces\*

The HC PLAN observation eyepieces (slot-in diameter 30 mm) are designed for direct visual observation. For the adaption of photo-micrographic equipment with a fixed magnification factor, e.g. DMLD and MPS systems, and for special TV adaption systems, special eyepieces with a slot-in diameter of **27** mm and the engraving **HC...PHOTO** are used (note the adapter!)

See special manual for further details on adapting photo and video equipment.

## Screwing objectives in and out

For the electronic version of the microscope, the DM IRB/E, the objectives are screwed in during the initial installation (see relevant chapter). For the manual version, proceed as follows:

Remove the screw covers from the objective threads.

Screw the objectives into the openings in the eyepiece so that the magnification can be changed in steps (e.g. in the order 4, 10, 20, 40).

Fig. 47



If any positions remain unoccupied, close them with a screw cover to prevent dust penetrating the microscope optics.

Please note that the front lenses of the objectives point upwards and are therefore more exposed to contamination than those on upright microscopes.

Therefore check fairly frequently that the front lens is clean.

A constantly updated optics sheet outlines the current range of objectives that can be used on the DM IRB/E. Ask your Leica agency for a copy.

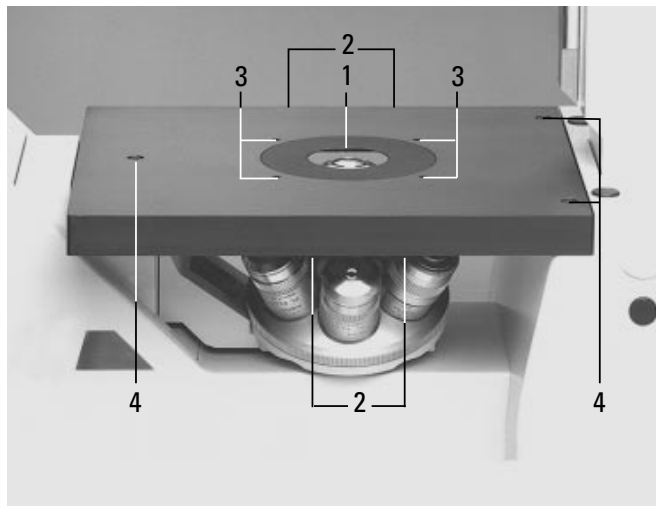
## Assembling the stages, the plane stage and object guide

### Plane stage

The plane stage is fixed to the microscope with 3 screws (48.4). The object guide can be mounted to either the right or the left of the plane stage (48.2).

Fig. 48 Plane stage

**1** Insert ring, 20/40 mm diameter, **2** Drill holes for mountable object guide, **3** Drill holes for specimen clips, **4** Drill holes for securing the stage



### 3-plate x/y stage

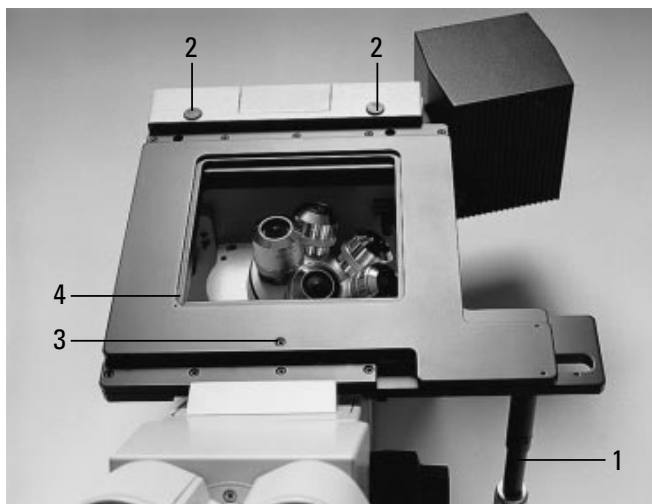
The 3-plate x/y stage no. 19, size 247 x 230 mm, x-y adjustment range 60 x 40 mm, is delivered in separate packaging and assembled as follows:

This stage is usually delivered with the DM IRM, so the description of its assembly has been taken from the DM IRM manual!

1. Screw the 3 Allen screws 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 (49.1) 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.

**Fig. 49** 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



To assemble the square insert plate:

1. Insert the corner of the insert plate that is marked red (50.5) at an angle from above into the corner of the stage that is also marked red and is fitted with a spring (50.5).



**n. b.:**

Only press the spring at the side!

Do not press the square insert plate onto the spring from above, as the insert will then not be aligned plane-parallel to the stage and can be bent.

2. Drill holes (50.2) for attaching small biological specimen clips.
3. Insert the round stage inserts into the opening (50.1).

**Fig. 50** 3-plate x/y stage

**1** Insert ring, 20/40 mm diameter, **2** Drill holes for specimen clips, **3** Drill holes for securing the stage, **4** Coaxial drive for specimen positioning with universal joint, **5** Red markings



## Rotary stage and insert frame for coverslips

The rotary stage is secured with 3 screws. The rotary mount has to be moved to make all the screw holes accessible. Align the screws (51.2).

**!** **n. b.:**

Washers (51.3) should be used as well for the back drill holes. Only screw the screws in lightly, as the rotary stage first has to be pressed into the centre. This is done by inserting the centration aid (51.4) into the rotary stage. Engage the Bertrand lens by turning the knurl and focus with the lever. Move the stage until the bright circle is in the centre of the field of view. Then secure the stage in position, disengage the Bertrand lens and remove the centration aid. To secure specimen slides in the frame inserts (52.1), press on the middle of the leaf spring (52.2) and slide in the coverslip in the direction of the arrow. Clamp the frame insert in the object guide (51.1).

## Connecting the microscope to the mains

When you have installed all the components as described, you can connect the microscope to the power supply with the mains cable.

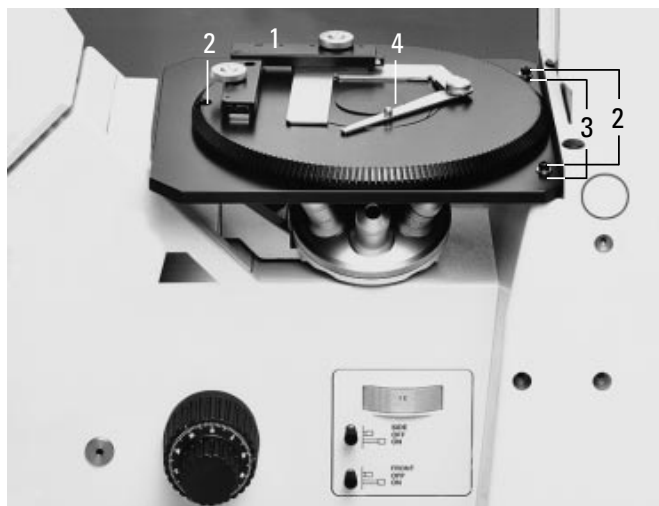
If you have the manual version of the DM IRB, installation is now complete and you can jump to the "Operation" chapter.

If you have a DM IRB/E model (i. e. the electronic version), you have to set up the system.

The following chapter describes how to set up the electronic version of the DM IR: the DM IRB/E.

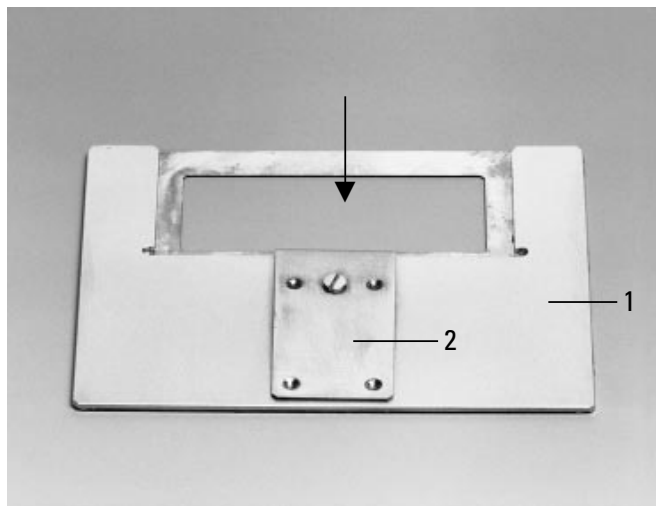
**Fig. 51** Rotary stage

**1** Object guide, **2** Screws for securing the stage, **3** Washers, **4** Centration aid



**Fig. 52**

**1** Frame insert for coverslips, **2** Leaf spring





## The E version DM IRB/E

### Features of the Leica DM IRB/E

The Leica DM IRB/E offers the following additional functions:

- Motorised, sextuple objective nosepiece
- Electronic focusing
- Coding of the IC objective prisms\*
- Motorised fluorescence filter cube change with electrically operated dark flap\*
- Control panel for remote control of the microscope components\*
- Footswitch\* (in connection with control panel or DM STC stage drive)
- LC display of microscope functions.

This manual applies to the Leica DM IRB/E inverted research microscope with Eprom version numbers:

Master (M)	2.40
Nosepiece (R)	2.30
Z drive (Z)	2.40

Deviations will therefore naturally occur for previous or subsequent versions.

\* The EPROM version number is displayed by simultaneously pressing the "LEARN" and "CHANGE" keys (Fig. 53b), and by pressing the "CHANGE" key afterwards the 3 EPROMS can be read out in succession.

For users who want to program the Leica DM IRB/E microscope themselves, a free software development kit called "Leica SDK" is available for Windows 3.11, Windows 95 and Windows NT on request.

### Important note:

Before using a brand new Leica DM IRB/E microscope for the first time, an initial installation has to be carried out.

### Function and operation

Straight after the Leica DM IRB/E microscope is switched on, the system will be initialised. This takes a few seconds. A message to this effect will appear in the LC display on the front of the microscope.

## Assembly and initial installation

The assembly of the individual components, such as transmitted light illumination column, condenser, etc. has been completed.

### n. b.:

The objectives should not be screwed in at this point. The best time to do this is when executing the learn mode.

Generally you are free to choose the order in which the separate steps of the learn mode are carried out. However, for the first installation we recommend you keep to the following order:

Check that the focus threshold  $\uparrow$  and the lower threshold  $\downarrow$  are deleted, i. e. neither of the two symbols may appear in the display.

If necessary, delete them by sustaining the relevant keys ( $\downarrow$   $\uparrow$ , Fig. 53b) for longer than 1 sec. Using the lower focus key, behind the handwheel on the right, move the nosepiece to the lower stop.

Fig. 53a

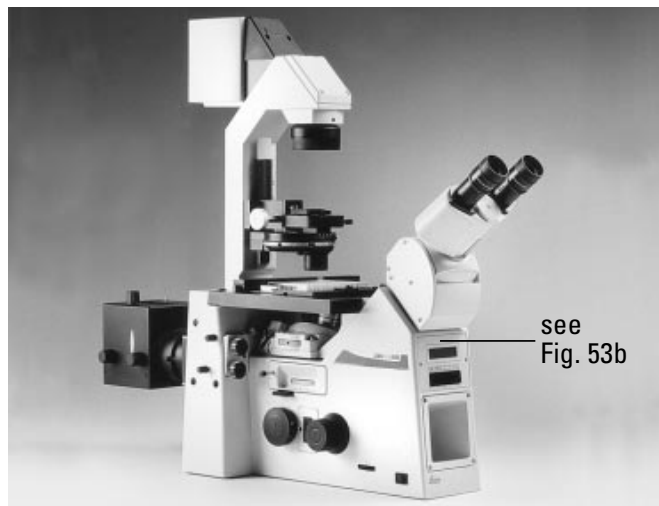
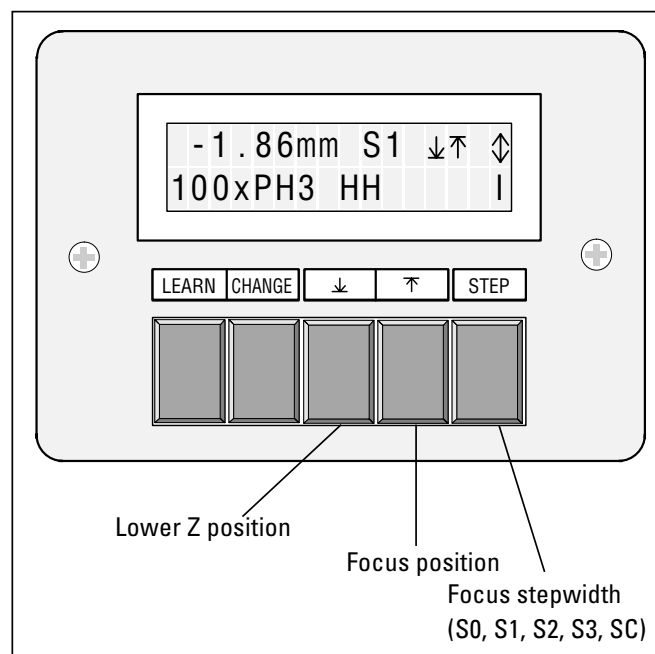
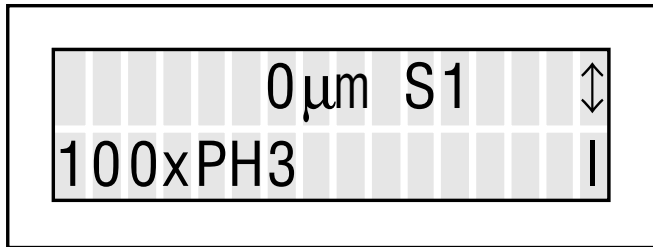


Fig. 53b Controls



# Learn mode

After switching on, the microscope is in the normal operation mode.

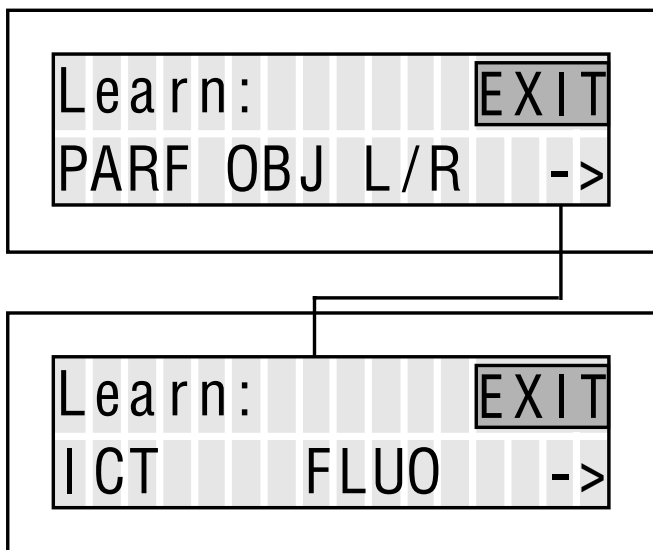


Normal operation mode

The learn mode is switched on with the "LEARN" key.

The objective nosepiece rotates through 180° so that the current objective is in the most accessible position (furthest to the right on the outside).

This function also serves for cleaning, assembling, immersing, etc. the objective.



Input menu of learn mode

The "EXIT" option in the display flashes.

If you press the "LEARN" key again, the current objective is rotated back into the observation position without any parameters being changed. Besides this, you automatically switch back to the normal operation mode.

## Installing the objective prisms

If your system is not equipped for interference contrast, skip this section and the next and continue reading at "Installing the objectives". The IC objective prisms are normally put in the turret at the factory. If you are retrofitting TL interference contrast, refer to the instructions on page 16 of the DM IRB manual.

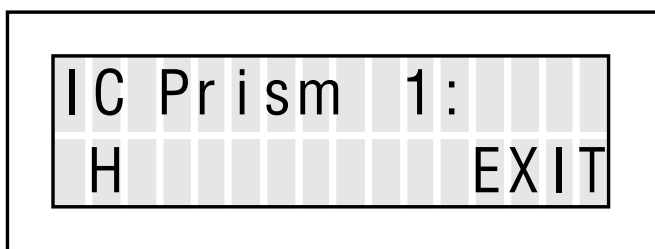
## Learning the IC objective prisms (IC turret)

Using the "CHANGE" key, select the ICT option in the Learn mode. Keep pressing the "CHANGE" key until the second learn menu appears and the ICT position in the display flashes.

Confirm by pressing the "LEARN" key.

Turn the IC turret (situated under the objective nosepiece) until it clicks into the brightfield position (H).

Operate the focus handwheel until the letter H appears on the display panel as well. Turn the IC turret by a quarter of a rotation into the next clickstop area. The message "IC prism 2" appears in the display. Read the marking on the turret and set the electronic display to the same code by turning the handwheel. Do this for all four positions. Empty positions should be coded "-".



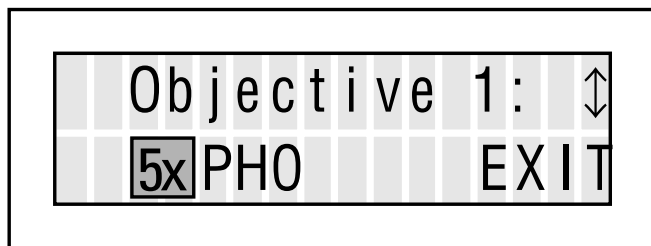
Learn mode: IC turret

Conclude the Learn mode for the IC turret by pressing the "CHANGE" key. "EXIT" flashes in the display; confirm with the "LEARN" key.

## Installing the objectives

Select the "Objectives" option in the Learn mode (OBJ) by pressing the "CHANGE" key; the "OBJ" option now flashes.

Confirm your choice with the "LEARN" key.



Learn mode: Objective data – Magnification

Select objective "1" by pressing the objective change keys (behind the focus handwheel on the left).

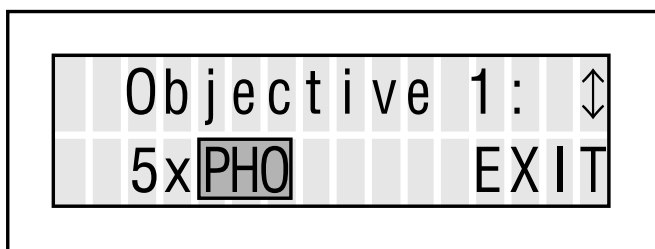
Now screw the objective with the lowest magnification into the nosepiece opening which is furthest to the right.

**Display: Objective magnification**

By turning the focus handwheel, select the number in the electronic display that corresponds to the magnification of the objective.

**Display: Phase contrast**

By pressing the "CHANGE" key, select the display field for phase contrast.

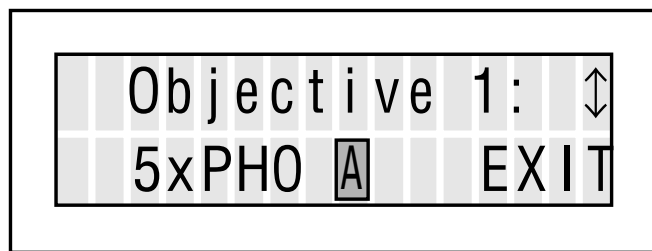


Learn mode: Objective data – Phase contrast

By turning the focus handwheel, select the display that corresponds to the engraving on the objective (PH1, PH2...). The symbol "--" is for brightfield objectives.

**Display: IC objective prism**

By pressing the "CHANGE" key, select the display field for the IC objective prism.



Learn mode: Objective data – IC coding (code letter)

By turning the focus handwheel, select the display that corresponds to the top line of engraving on the objective (A, B, C, D, E, F). The symbol "H" (Hellfeld, = brightfield), is for objectives that are not suitable for IC.

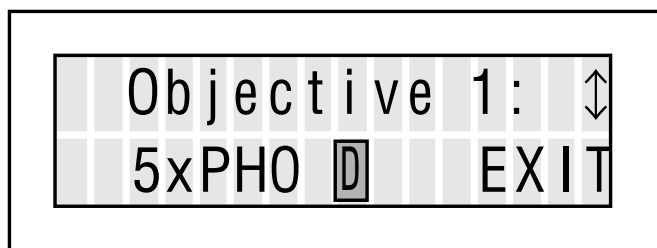
The choice of objective prism that can be set here is confined to the IC prisms that are actually on the IC turret and that have been learned.

### Operating modes: Dry/Immersion

To ensure simple yet safe objective change, the objectives have to be classified in one of the following three categories:

1. Dry objectives (D) = all dry objectives with a short working distance ( $\leq 3$  mm).
2. Immersion objectives (I).
3. Combined objectives (C) = dry objectives with a long free working distance ( $> 3$  mm), objectives which can be used for scanning purposes as well through an oil layer.

By pressing the "CHANGE" key, select the display box for the operating mode. Now select the valid objective category for the objective you are using (D, I, C) by turning the focus handwheel.



Learn mode: Objective data – Operating mode

Now all the objective parameters for the first objective have been learned, and the other objectives can be installed.

### To learn further objectives:


Select objective no. 2 with the upper objective nosepiece key. Screw the objective with the next highest magnification into the nosepiece opening which is now furthest to the right.

By turning the handwheel, select the magnification display that matches the objective, as you did for the first objective. Proceed in the same way for setting the Phaco display, the IC prism display and the operating mode. Then repeat the setting procedures for the other objectives.

Nosepiece positions that are not occupied by an objective are given the code "--". This has the effect that these positions are not travelled to in standard mode.

Conclude the Learn mode for the objective parameters by pressing the "CHANGE" key. "EXIT" flashes in the display; confirm with the "LEARN" key.

Before selecting the "Parfocality" option in the Learn mode, you should take the following steps:

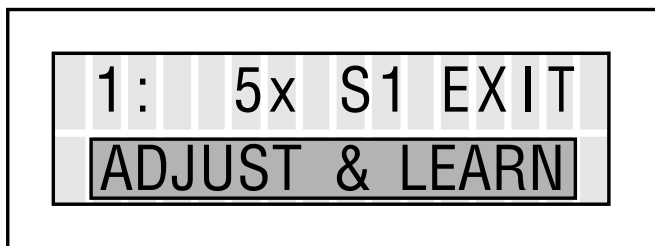
- If you want to use a specimen holder on your stage, fit it now.
- Put a specimen on the stage.
- Switch to the highest magnification and focus the image of the specimen.
- Set the focus position with the  key (→ Fig. 53b).

You can now begin with learning the parfocality.

## Parfocality

Select the "Parfocality" option ("PARF") in the Learn mode by pressing the "CHANGE" key; the "PARF" option now flashes.

Confirm your choice with the "LEARN" key.



Learn mode: Parfocality

## Dry objectives

Select the dry objective with the highest magnification by pressing the objective nosepiece keys (behind the focus handwheel on the left).

Focus the specimen with the focus handwheel. Use the "STEP" key to select the suitable focus stepwidth, also using the focus keys if necessary (behind the handwheel on the right). When the focus position is set, the z drive stops near the focal plane.

Confirm the learned focus position by pressing the "LEARN" key. "ADJUSTED" appears in the display.

Now select the dry objective with the next lower magnification.

Focus the specimen again with the focus handwheel and confirm with "LEARN".

Repeat this procedure until you have reached the smallest dry objective.

For low-power dry objectives (5x, 10x) it is advisable not to correct the focus any further, as these objectives are focused immediately after switching on.

## Oil immersion objectives

Once the parfocality has been learnt for all the dry objectives it can be done for the immersion objectives.

Please remember that if the specimen is very small and lightweight it must be fixed onto the stage to prevent it being moved by the adhesive force of the oil.

Select the oil immersion objective with the objective changing key.

Apply a drop of immersion oil to this objective.

To do this, you can move the objective to the most easily accessed outer position with one of the objective changing keys.

Return the objective to the working position and focus.

Confirm the learnt focus position by pressing the "LEARN" key. "ADJUSTED" appears in the display.

Proceed similarly for any other immersion objectives.

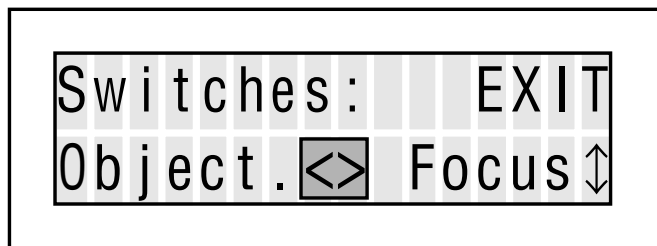
Conclude the parfocality setting by selecting the "EXIT" option with the "CHANGE" key and confirming with "LEARN".

## Exiting the Learn mode

To leave the Learn mode, select "EXIT" and confirm with "LEARN".

## Individual user adjustments

Select the option “L/R” in the Learn mode by pressing the “CHANGE” key and confirm your choice by pressing the “LEARN” key.



Learn mode: User adjustment

This option allows you to choose whether you want to operate the objective nosepiece on the left or the right side of the microscope. The function of the focus keys then also shifts to the other side of the microscope.

It is also possible to reverse the rotation direction of the handwheel and its effect on the focusing direction.

Z-drive keys	Objective keys	Nosepiece movement when the right handwheel is turned clockwise	Chosen function
right	left	up	Object.<> Focus ⇅
right	left	down	Object.<> Focus ✕
left	right	up	⇅Focus <> Object.
left	right	down	✕Focus <> Object.

Possible combinations for user adjustment

By turning the focus wheel, choose the one of the four possible combinations that suits you best.

The standard setting made at the factory is as follows (= combination 1 in the above table):

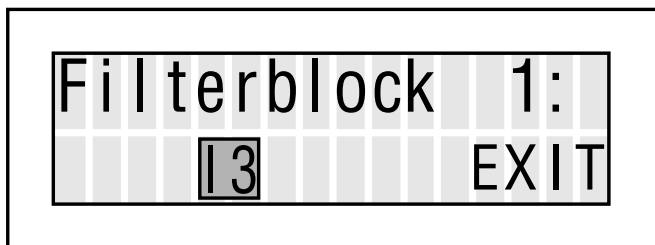
- The nosepiece is operated on the left side of the microscope; accordingly the keys for lowering and refocusing are on the right.
- Rotation direction of the handwheel and focusing movement:  
If the handwheel on the right of the microscope is rotated clockwise, the objective nosepiece is moved upwards, i. e. the objective moves towards the sample.

Conclude the Learn mode for user adjustment by pressing the “CHANGE” key. “EXIT” flashes in the display; confirm with “LEARN”.



## Installing the fluorescence filter cube

Select the "FLUO" option in the Learn mode by pressing the "CHANGE" key. Confirm by pressing the "LEARN" key.



Learn mode: Fluorescence

Pull out the filter cube drawer on the left side of the microscope stand and put the filter cube you want to use in the holder of the fluorescence turret plate in the light path. The filter cube must click noticeably in position.

Now select the corresponding filter cube name in the LC display by rotating the focus hand-wheel.

Learning other filters:


Select the next filter cube position by pressing one of the "FLUO" keys on the control panel of the FLUO module. Insert the filter cube and select the corresponding name in the display. Repeat the procedure for any other filters. Unoccupied positions are given the code "-".

To conclude the Learn mode for the fluorescence module, press the "CHANGE" key. "EXIT" then flashes in the display; confirm with "LEARN".

Now leave the learn mode by pressing "EXIT" and confirming with "LEARN".

## Concluding the installation

Installation is now complete. You are back in the normal operation mode.

Before you start work, you should set the focus threshold with one of your specimen slides. (with the  key, → Fig. 53b).

## Motorized objective nosepiece

The electronic nosepiece control allows easy and safe change of the objective magnification. Objectives are changed with 2 push buttons (objective changing keys) which are easily accessed behind the focusing handwheel on the **left** of the microscope.



Left side of microscope

The **upper** key is pressed to **increase** the magnification, the **lower** key to **decrease** the magnification. Short pressure on the key switches to the next lower or higher magnification. If you sustain the key for longer than 0.3 sec., the display jumps to the next higher or lower magnification every 0.5 sec. The nosepiece is not actually turned until you choose a specific magnification by releasing the key. All you have to do to switch from any higher magnification down to survey magnification, for example, is to sustain the lower objective key for approx. 3 sec. The selected objective is turned into the light path in the direction that involves the shortest travel distance.

### **n. b.:**

When installing the system (see "Individual user adjustments", → p. 48) it is possible to operate the objective change function on the **right** side of the microscope instead of the **left**.

# Operating modes



## DRY and IMMERSION

The Leica DM IRB microscope is equipped with a switch function between the operating modes “Dry” and “Immersion” (IMM) to ensure straightforward, error-free operation.

This prevents

- dry objectives from being immersed in oil by mistake
- immersion objectives from being used without immersion oil by mistake.

## Changing the operating mode



The operating modes are switched by simultaneously pressing the keys “lower z position”  and “focus position”  on the control panel of the microscope. This means that immersion cannot be travelled to in Dry mode and dry objectives with a short working distance cannot be travelled to in Immersion mode.

To ensure smooth operation, immersion oil must be applied to all oil immersion objectives in the nosepiece that are to be used before you start work.

Contamination of the dry objectives is prevented by the fact that the objective nosepiece is always lowered before objectives are changed.



When switching from one operating mode to the other, please proceed as follows:

Starting in the DRY mode:

(Display at the bottom right in the LD display: D)  
Press the keys “lower z position”  and “focus position”  on the control panel of the microscope simultaneously to switch from Dry to Immersion.

The objective nosepiece is lowered and the message “Change Objective” appears in the display. The corresponding oil immersion objective is switched into the light path with the objective changing key (normally the upper objective changing key). From now on, only oil immersion objectives or objectives of the “Combined” category are travelled to. (“I” now appears in the LC display at the bottom right).

The procedure for switching to the Dry mode is analogous:


Again, press the keys “lower z position”  and “focus position”  on the control panel of the microscope simultaneously to switch from “Immersion” to “Dry”.

The objective nosepiece is lowered and the message “Change Objective” appears in the display. You now have the opportunity to put a new specimen slide (without immersion oil) on the stage. Then, using the objective changing key, switch the appropriate dry objective into the light path (normally the lower objective changing key). From now on, only dry objectives or objectives of the “Combined” category are travelled to.

(“D” now appears in the LC display at the bottom right).

To learn objective categories, see “Installing the objectives” (→ p. 44).

### **Automatic lowering of the objective nosepiece**

In order to be able to operate the objective changing keys easily and without touching the stage in situations where space is difficult, e.g. if there are small object inserts in the stage and/or if the specimen plane is relatively high above the stage level, the objective nosepiece is lowered before it is rotated. The end position for this lowering (= lower z position ) can be chosen by the user.

If the lower z position is not set, the objective nosepiece is lowered by the maximum possible distance.

# Brightness adjustment

Instead of a potentiometer, Leica DM IRB/E microscopes are equipped with an incremental transducer for brightness adjustment. This means that the adjustment wheel is automatically moved from clickstop to clickstop and therefore has no end stops.

After it is switched on, the microscope is in normal operating mode. In the first line of the LC display, the current Z position is given in  $\mu\text{m}$  or mm on the left.

You can switch to the lamp voltage display by pressing the "CHANGE" key on the control panel. The lamp voltage is displayed in volt from 2.5 – 12V. If you press the "CHANGE" key again you return to the display of the Z position.

The lamp intensity is adjusted by rotating an adjustment wheel on the left side of the microscope. If you hadn't already switched to the lamp voltage display, this will happen automatically when you move the wheel. Similarly, the display will switch to the Z position if the Z position is changed with the handwheel or by pressing the key.

To switch off the transmitted light illumination, the brightness is first reduced to 2.5V. Then rotate beyond the lower value.

To switch on again, rotate briefly in the opposite direction.

For photomicrography we recommend a setting of 10.5V.



# Electronic focus

The electronic focus offers the user the following advantages:

- Extremely sensitive focusing, especially for high magnifications.
- Fine focusing selectable in 4 steps; coarse focusing can be switched on “blind” at any time.  
The stepwidths desired by the user (corresponding to gear ratio and sensitivity) are allocated to every single objective and automatically reset as soon as the particular objective is used.
- Fast lowering of the objective nosepiece and exact repositioning to the previously set focal plane.
- Electronic parfocality of all objectives through intelligent linking of motorized objective nosepiece and electronic focus drive.

The controls of the electronic focus are:

- The focusing handwheels, conventionally positioned on both sides of the microscope.
- Two keys (focus keys) for fast lowering of the objective nosepiece and returning to the focal plane. The keys are in a convenient position in front of the right handwheel.  
If both focus keys are pressed simultaneously, coarse focusing is switched (SC). The coarse focus is switched off again the moment that the two keys are pressed simultaneously again, or a different focusing speed is switched with the STEP key.
- Key for switching the focusing speed (“STEP”, S0 = 0.05  $\mu\text{m}$ , S1 = 0.1  $\mu\text{m}$ , S2 = 0.7  $\mu\text{m}$ , S3 = 1.5  $\mu\text{m}$ ) on the front of the microscope. The micrometer values always indicate the smallest stepwidth that can be carried out.

- Key  for defining the “lower Z position”. Pressing the key for longer than 1 sec. deletes the threshold; another press of the key for longer than 1 sec. sets the current Z position as “lower threshold”.
- Key  for defining the “upper Z threshold” (= focus position). Pressing the key for longer than 1 sec. deletes the threshold, another press of the key for longer than 1 sec. sets the current Z position as “upper Z threshold”.



**n. b.:**

If using the microscope without the stage plate, please note that when you replace the front fixing screw if the stage plate, it must not be screwed in fully. If it is screwed in too far it will block the focus motor. The message BLK then appears in the LC display on the front of the microscope.

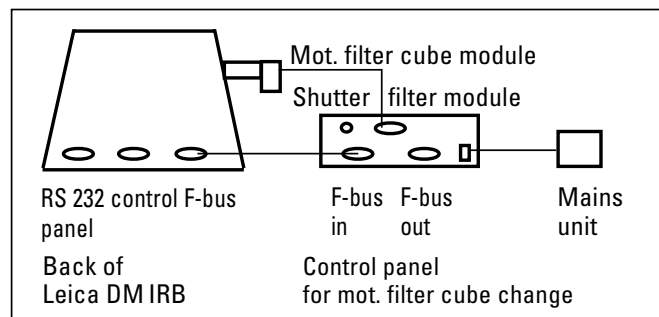
### **Coded IC objective prisms (option)**

The objective IC prisms are arranged on a turret underneath the objective nosepiece. To facilitate allocation and thus the setting of the objective prisms to the objectives, the LC display on the front of the microscope indicates both the IC prism required for the objective in the light path and the currently effective IC prism on the turret.

The latter flashes if the combination is wrong.

## Motorised fluorescence filter cube change (option)

A control panel is connected to the Leica DM IRB for motorised filter cube change.



Connection for motorised fluorescence filter cube change

Three keys are used for operation:



The two "FLUOR" keys are used to switch to the adjacent filter cube. If you switch one of these keys twice, you switch by two filter cube positions.

The "SHUTTER CLOSED" key is used for opening and closing the electric shutter. The LED indicates whether the shutter is closed or not (LED lights up when closed).



## Control unit\*

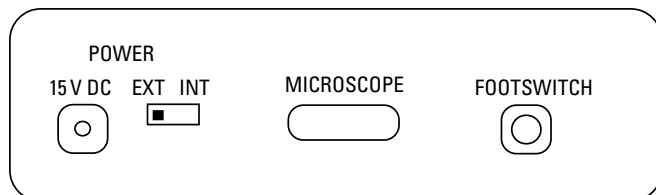
An electronic control unit can be connected for the remote control of individual microscope components such as objective nosepiece and Z drive.

It is operated with keys on the front of the control unit.

The control unit can also be combined with a dual footswitch.

## Connecting the control unit

The connection port is on the back of the unit.



Connection port of the control unit

When using a Leica DM IRB microscope, the unit must be powered by an external power unit. The switch on the back of the unit must therefore be at EXT, and voltage is supplied via an ordinary 7V plug-in-power supply.

(Mains unit: 7 – 15 V, pole direction  $\ominus$ — $\oplus$ — $\oplus$ ,  
 $I = > 100$  mA).

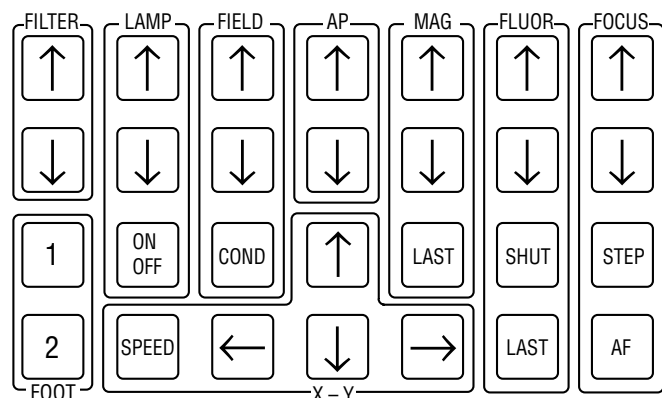
The supplied connecting cable is connected to the MICROSCOPE socket on the control panel and CONTROLPANEL on the microscope.

The CONTROLPANEL interface on the microscope is active from Eprom version number 2.4 upwards.

Optionally, a dual footswitch, order no. 505 096, can be connected to the FOOTSWITCH socket.

## Keys on the control unit

The control unit is operated by keys.



Keys on the control unit

The keys can be used to operate the following microscope components:

Component	Name on the unit	
Filter	FILTER ((in preparation)	
Lamp	LAMP	
Condenser	COND	] function not possible on Leica DM IRB/E
Field diaphragm	FIELD	
Aperture diaphragm	AP	
Objective change	MAG	
Incident light fluorescence axis	FLUOR	
Z drive	FOCUS	
x-y stage	X-Y	
Footswitch	FOOT	

Several keys are allocated to each component. These are grouped together on the key panel.

The control unit is operated in a similar way to the key-mode operation of the Leica DM IRB microscope.

Significance of individual keys:

### **LAMP**

Brightness can be adjusted with the arrow keys:  
Up arrow → brighter, down arrow → darker.

The ON/OFF key is used to switch the lamp off and on. When it is switched on again, the brightness that was set before it was switched off is reset.

### **MAG**

The arrow keys are pressed to change the magnification. The objective nosepiece rotates to the next higher magnification within the same operating mode (IMM/DRY) when the upwards arrow key is pressed once. Similarly, the next lower magnification is switched to when the downwards arrow is pressed. If the same key is pressed more than once in quick succession, the nosepiece is rotated by the corresponding number of valid positions.

This is also the reason why the nosepiece rotation is slightly delayed after the keys are pressed.

The LAST key is used to switch to the objective that was used last.

### **FLUOR**

The arrow keys are used to switch from one filter cube to the next.

Pressing the keys several times causes the corresponding position to be jumped to.

The LAST key positions the filter cube that was set before the last keystroke.

The SHUT key is used to close the dark flap.

## **FOCUS**

Here the arrow keys control the movement of the Z drive.

The movement speed for the fine focusing is selected with the STEP key. For safety reasons, the movement range is limited to 400  $\mu\text{m}$  above the focus position and 400  $\mu\text{m}$  below the lower Z position.

If both arrow keys are pressed at the same time, the system switches to coarse focusing (SC). The Z drive then moves at a higher speed. Here, the movement range is limited by the set threshold (lower Z position) and at the top end by the focal plane (focus position), to prevent collision damage. The coarse focus is switched off the moment the two arrow keys are pressed simultaneously again or a specific focus speed is selected with the STEP key.

The AF key is not assigned yet.

## **X-Y**

The arrow keys define the direction in which the stage is to move.

Two different speed modes can be preselected (Slowmode/Fastmode) with the SPEED key. The travel speed is increased as a function of the speed mode with a predefined ramp: the longer one of the arrow keys is pressed, the faster the stage moves. The speed mode determines the maximum speed.

## **FOOT**

The left footswitch is assigned a function via key 1, the right footswitch via key 2.

After the microscope is switched on, the footswitches have the default function Magnification change.

To assign a different function, first press key 1 or 2 and then the desired function key. An acoustic signal is given for correct inputs.

## Examples for the use of the footswitches

### Example 1

Switching between two magnifications with a footswitch:

Set a magnification and switch to a second magnification you would like to use. Assign the LAST function for magnification change to the left, by first pressing key 1 and then the LAST key (at MAG). Now switch between the two magnifications with the left footswitch.

### Example 2

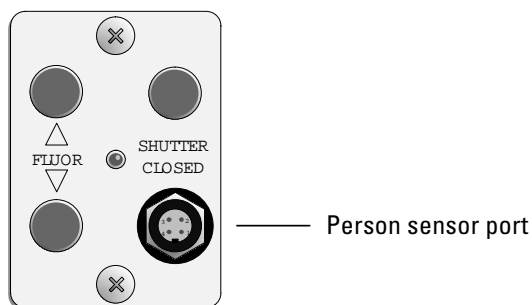
Switching between two fluorescence filters with a footswitch:

Set a filter cube with the arrow keys in the FLUO box and switch to a second filter cube you would like to use. Assign the LAST function for filter cube change to the right footswitch, by first pressing key 2 and then the LAST key (at FLUO). Now switch between the two fluorescence filters with the right footswitch.

## Person sensor (option)

The dark flap can be opened automatically via a sensor when you look through the microscope and closed again when you look away.

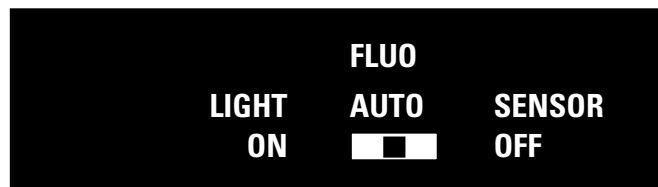
This is achieved by mounting the person sensor (order no. 505 101) onto the right eyepiece tube and connecting the cable on the sensor to the SHUTTER socket on the control unit for motorised filter cube change.



The diode next to SHUTTER CLOSED indicates whether the dark flap is currently open (diode off) or closed (diode on).

You can control the dark flap manually by pressing the key above SHUTTER CLOSED or with the SHUT key on the control unit.

When the microscope is switched on the dark flap is closed at first. To activate the person sensor you first have to open the dark flap manually.



Front view of the person sensor

## Switch position AUTO

The dark flap is opened when you look through the eyepiece. When you move away, it will be closed again after about 3 seconds.

## Switch position LIGHT ON

The dark flap remains open (e.g. for photomicrography). If the flap is still closed, it must be opened first manually. It will then remain open.

## Switch position SENSOR OFF

The person sensor is switched off. The position of the dark flap remains unchanged.



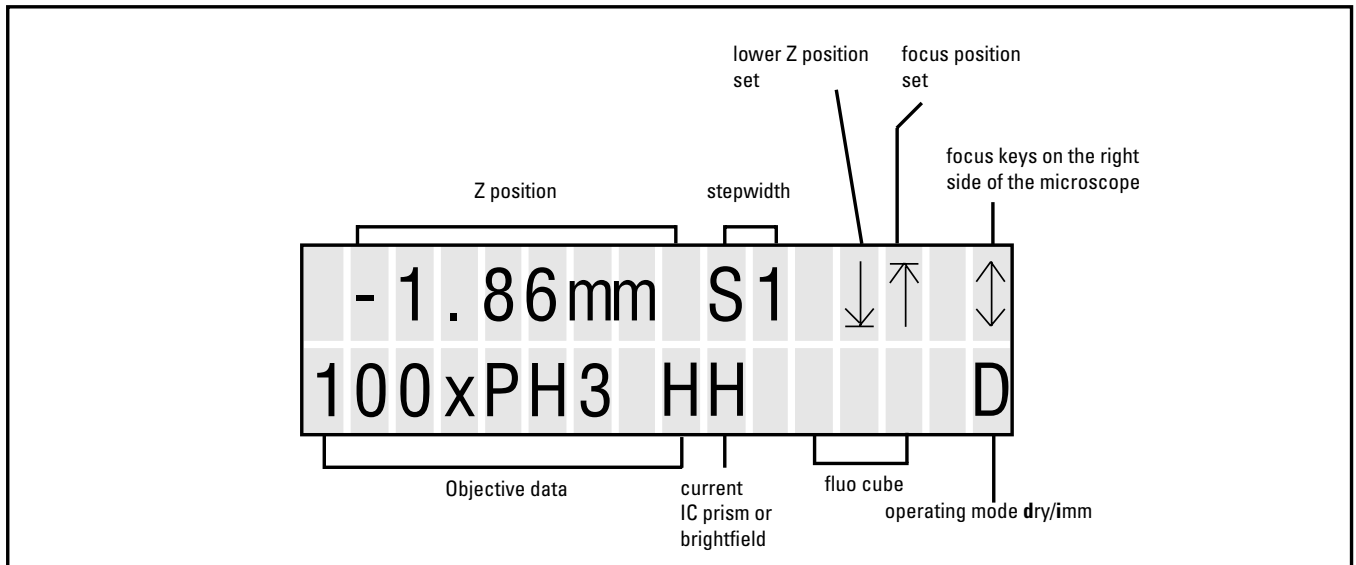
**n. b.:**

The shutter key on the microscope or on the control unit can be operated at any time. The SHUTTER CLOSED diode indicates whether the flap is currently open or closed.

If the dark flap is closed before the automatic functions are switched on, it has to be opened manually before the automatic functions take effect.

## Front controls

There is an LC display and five control keys on the front of the microscope.



LC display

The display gives information on the following functions:

- Z position in  $\mu\text{m}$  or mm.
- Set stepwidth for the fine focusing (S0, S1, S2, S3 and coarse focusing = SC, can be switched on and off by simultaneously pressing both focus keys).
- Lower Z position set (symbol visible = threshold set).
- Focus position set (symbol visible = threshold set).
- Objective data (corresponding to the objective engraving).
  - magnification
  - Phaco (PH1, PH2, ...)
  - required objective IC prism (option).
- Currently switched IC prism or brightfield position.
- Fluo cube (option).
- Operating mode (dry or immersion).

At the factory the microscope is set so that the fast focusing is controlled with the two keys on the **right** side of the microscope, indicated by the symbol  $\updownarrow$  on the **right** in the upper line of the display.

Similarly, if this symbol appears on the **left** side of the display, it means that the focusing is controlled with the two keys on the **left** of the microscope.

### **n. b.:**

When the microscope is installed the influence of the rotation direction of the handwheel on the focusing direction of the objective nosepiece can be reversed ( $\rightarrow$  p. 48).

# Operation



n. b.:

When using acids or other aggressive chemicals, special care should be taken. Avoid direct contact of these substances with optical and mechanical components.

# Basic setting for transmitted light

## Switching on the halogen lamp

Switch on the 12 V 100 W lamp at the mains switch (55.7).

Adjust the brightness with the dial. The numbers are not absolute parameters, but merely serve for reproducible setting. The white dot on the dial indicates the setting for approx. 3200 °K for photography on artificial light film and for TV microscopy.

Fig. 54 – 55

**1** Binocular phototube, **2** Eyepiece tube, **3** Eyepieces, **4** Tube mount (tube interface), **5** Tube port for photo/TV connection, **6** Beamsplitter switch, **7** Mains switch, **8** Brightness adjustment, **9** Lateral TV port, **10** Coaxial coarse and fine drive, **11** Fluorescence module, **12** ICT prism adjustment, **13** Sextuple objective nosepiece, **14** Centring buttons for incident light field diaphragm, **15** Field diaphragm adjustment, **16** Filters, **17** Aperture diaphragm adjustment, **18** Lamphousing mount (or mirrorhousing for two lamphousings), **19** Lamphousing, **20** Stage plate, **21** Analyser, **22** Tube lens module (Bertrand lens and magnification changer), **23** Switch rod for lateral TV port, **24** Transmitted light illumination column, **25** Condenser, **26** Transmitted light lamphousing, **27** Transmitted light field diaphragm, **28** SLR port, **29** Second lamphousing

Fig. 54 View from right side of microscope

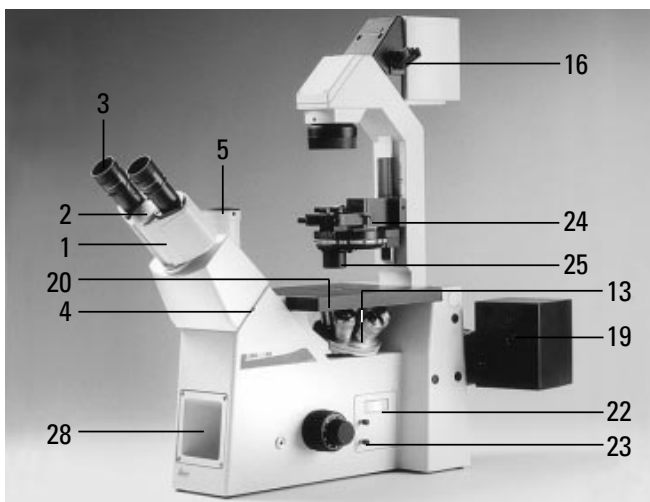
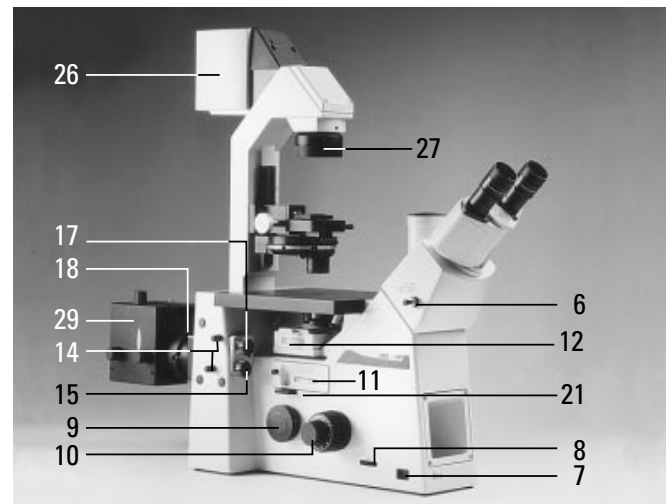


Fig. 55 View from left side of microscope





## Adjustment specimen

For initial microscope adjustment we recommend you use a specimen that has both high and low contrast areas.

It is easier to focus incident light fluorescence specimens in transmitted light first.

## Focusing the specimen

(For the DM IRB version, please read the section about the operation of the E focus and objective nosepiece first. Here, an example of manual operation is given for each case.)

Focus the specimen you want to examine. To do this, the objective nosepiece should be lowered first. The objective is turned into the light path by rotating the black knurled knob on the nosepiece. The objective should click audibly into position.

Focus the specimen with the coarse and fine drive, which changes the height of the objective nosepiece. The stage height remains unchanged. The total vertical travel of the nosepiece is 7 mm. In air, the focusing range extends from 2 mm below the stage surface to 5 mm above it.

One drum interval of the fine focusing corresponds to about 2 mm of the objective nosepiece.



### Caution!

Please be careful with high objective magnifications when focusing or making x-y adjustments!

When using objectives with a high magnification and a short working distance (from 50x), the specimen and the stage insert may be lifted and tilted.

When scanning the specimen, the front lens of the objective may knock against the edge of the stage insert.

Lower the coarse and fine drive if possible when turning the nosepiece and changing the objectives, in order to avoid contact between the front lens and the stage insert.



### n. b.

Caution with special objectives! Here there may be contact between the stage insert and the front lens the moment the objective is moved over the edge of the inner hole of the stage insert!

## Checking of various microscope components

Engage or disengage the filters (54.16) according to the required brightness.

If necessary, disengage the Bertrand lens by turning the knurled knob (54.22), pos. 1.

Disengage the analyser (55.21), if necessary, by pulling it out partway.

Disengage the filter systems, if necessary, by rotating the turret (55.11).

Push in the switch rod(s) for the beamsplitter (54.23).

Clamp the transmitted light illumination arm with the knurled wheel (5.1).

## Operation of L objectives with correction mount

Roughly set the correction mount to the thickness of the base of the vessel on the stage by turning the knurled ring. Focus the specimen with the coarse and fine drive. Then operate the correction mount until you achieve the greatest image contrast, using the fine focus if necessary.

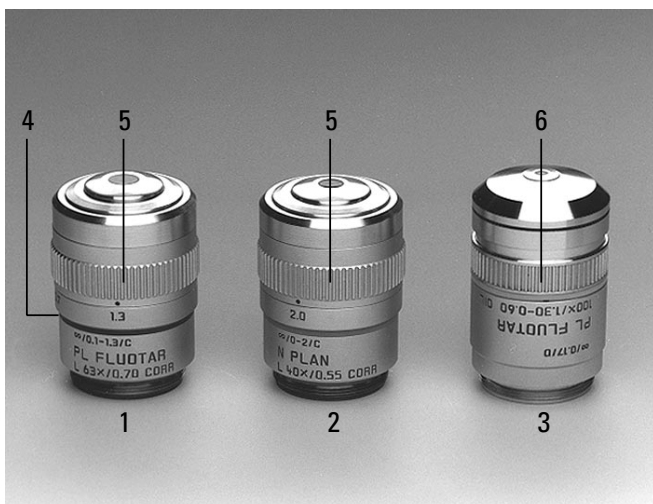
## Setting the tubes and eyepieces

Eyeglass wearers must remove (for 10x/25) or push back (for 10x/20 and 10x/22) the anti-glare protection of the eyepieces, but it should always be left on for viewers not wearing eyeglasses.

- Set the interpupillary distance on the tube by pulling apart or pushing together the eyepiece tubes until only one image can be seen with both eyes.
- Note your personal interpupillary distance.
- If using ergotubes, set the viewing angle ( $15^{\circ}$ – $50^{\circ}$ ) as well by tilting the binocular viewing port. To avoid symptoms of fatigue, vary the viewing angle from time to time.
- Close any tube exits you are not using to prevent stray light disturbing the image.

**Fig. 56** Examples of objectives

**1, 2** Objectives with correction mounts (Corr) for adjusting to different vessel base thicknesses (e. g. 0.1 – 1.3 mm and 0 – 2 mm), **3** Objective with built-in iris diaphragm (1.30 = maximum aperture, 0.60 = minimum aperture), **4** Magnification colour code, **5** Knurled ring for adjusting the correction mount, **6** Knurled ring for adjusting the built-in diaphragm



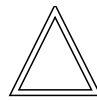
## Binocular tube HCI B22 or HCI BV22

### For eyepieces with inserted graticule only\*:

- Greatly defocus the specimen or remove from the light path.
- Exactly focus the graticule by adjusting the eyelens with a relaxed eye (the eye relaxes best if you look out the window at a distant object for a moment).
- Focus the specimen, only adjusting the eyepiece with graticule.
- Then close this eye and focus the specimen by adjusting the second eyepiece only.

### Only if neither eyepiece has a graticule inserted:

- Greatly defocus the specimen or remove it from the light path.
- Adjust the eyelens until the edge of the field of view appears sharp. When you adjust the eyelens a white line becomes visible round the basic part of the eyepiece. This indicates the correct position of the eyelens for viewers with normal or corrected eyesight.



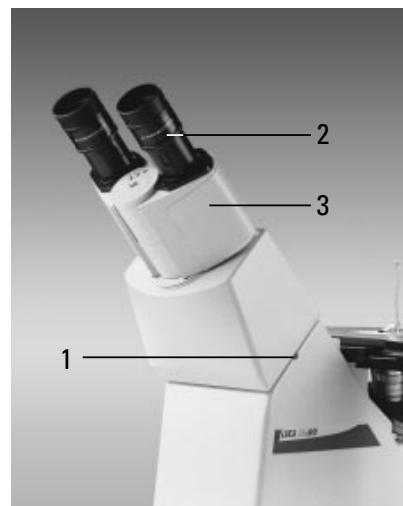
Eyeglasses with multirange lenses (bifocal and progressive) must be removed for microscopy.

- Focus the specimen through the eyepieces.

### Only when one eyepiece is without an adjustable eyelens:

- Exactly focus the specimen through this eyepiece first (close your other eye).
- Then focus the image by adjusting the eyelens of the second eyepiece.

**Fig. 57** HCI B22 binocular tube, 45° viewing angle, field of view no. up to 22, eyepiece diameter 30 mm for HC PLAN 10x/20 or 22 eyepieces, interpupillary distance setting: 55 – 75 mm  
**1** Eyepiece tube, **2** Eyepiece, **3** Anti-glare protection



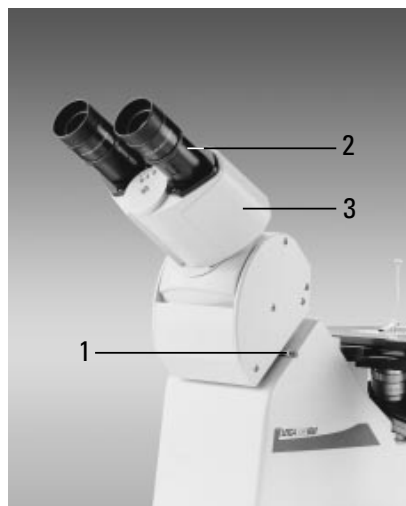
To correct defective eyesight:

- Look through the right-hand eyepiece tube with your right eye and sharply focus the specimen with the fine drive.
- Then look at the same area of the specimen with your left eye and rotate the left eyepiece tube until you obtain a sharp image. Do not use the fine drive for this.
- If using eyepieces with adjustable eyelenses, do not compensate for defective eyesight by adjusting the eyepiece tube, but by adjusting the eyelens of the eyepiece.

**Fig. 58**


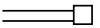
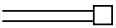
HCI BV22, ergo binocular tube with 15°–50° viewing angle, field of view no. up to 22, eyepiece diameter 30 mm for HC PLAN 10x/20 or 22 eyepieces, interpupillary distance setting: 55–75 mm

1 Clamp screw, 2 Tube port, 3 Siedentopf binocular part



Trinocular tube HCI 3T22

- Set the beamsplitter at visual observation by pushing in the switch rod. The switching positions are indicated by symbols on the side of the tube.

100 % vis	– switch rod	
50 % – 50 %	– switch rod	
100 % – photo	– switch rod	

- The eyepieces are set in exactly the same way as on the binocular tube.
- Compensate defective eyesight by adjusting the eyelens of the eyepiece.

**Fig. 59** HCI 3T22, trinocular tube with 45° viewing angle

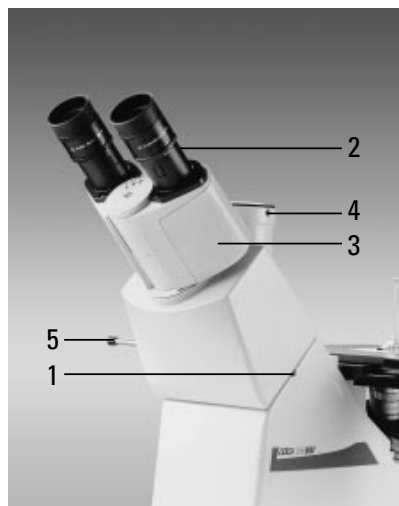
Light path: 100 % vis – switch rod

50 % – 50 % – switch rod

100 % – photo – switch rod

Field of view no. up to 22, eyepiece diameter 30 mm for HC PLAN 10x/20 or 22 eyepieces, interpupillary distance setting: 55–75 mm

1 Clamp screw, 2 Tube port, 3 Siedentopf binocular part, 4 Photo/TV port, 5 Switch rod



### Operation of the side photo/TV port

The delivery comprises two alternative outfits for the lateral photo/TV exit (Fig. 59a).

One outfit has a beam split of

- |   |              |           |
|---|--------------|-----------|
| 1 | 100 % visual | 0 % side  |
| 2 | 20 % visual  | 80 % side |

The second version has a beam split of

- |   |              |            |
|---|--------------|------------|
| 1 | 100 % visual | 0 % side   |
| 2 | 0 % visual   | 100 % side |

If the switch rod (60.2) for the side port is pulled out, the beam split version no. 2 is active. If the switch rod is pushed in, beam split no. 1 applies.

### Operation of the front photo/TV port

Stands either with or without SLR front port can be supplied.

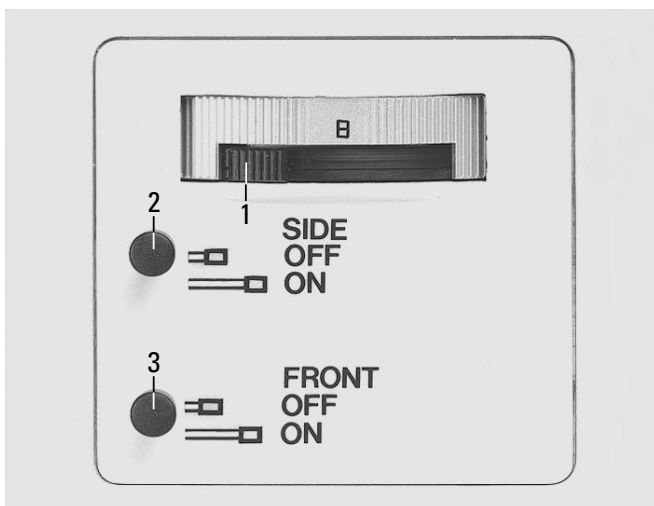
The beam split is as follows:

The side port is switched off, i. e. 100 % of the light goes to the visual light path:

If the switch rod (60.3) for the SLR exit is pulled, 50 % of the light goes to the SLR and 50 % to the tube.

**Fig. 60** Bertrand lens engaged

**1** Lever for focusing the Bertrand lens, **2** Switch lever for side port, **3** Switch lever for front port



# Operation of objectives

## Immersion objectives

**OIL:** Only use DIN/ISO standard immersion oil.



**n. b.:**

Observe the safety information on the immersion oil!

**W:** Water immersion. The special water immersion objectives with ceramic front part can be used for all hydrous solutions.

**IMM:** Universal objective for water, glycerine and oil.

## Colour coding of objectives

→ “Technical data”.

## Locking objectives

Some immersion objectives (with knurled grip) can be locked in a shorter position. This prevents any remaining drops of immersion liquid from wetting other objectives or specimens when the nosepiece is turned.

- Press up the front part by about 2 mm.
- Lock the objective in this position by rotating slightly.



**n. b.:**

When using the immersion objective again, remember to release the lock, as otherwise the spring mechanism that protects the specimen and objective will not work and the other objectives will no longer be parfocal with the immersion objective.

## CORR objectives

These are special objectives which can be adjusted to the thickness of the coverslip.

- Roughly set the correction mount to a medium or estimated value by turning the knurl.
- Focus the specimen.
- Adjust the correction mount until you obtain optimum contrast, fine-tune the focus with the fine drive if necessary. This setting may be very difficult for featureless or low-contrast areas of the specimen.

# Operation of transmitted light

## Brightfield illumination

Illumination techniques where the empty areas of the specimen are the brightest parts are called brightfield. Absorbing specimen structures are required for brightfield imaging, i. e. most specimens will need staining. Alternatives are optical contrasting techniques such as phase or modulation contrast.

## Setting the condenser

On the TL illumination column there are height markings – S70, S23 and S1 – (13.3) for setting the correct condenser height. Using the supplied hexagonal screwdriver, slacken the screw (14.1) and adjust the height of the condenser or condenser holder until its upper edge coincides with the corresponding condenser height marking on the illumination column. Retighten the condenser or condenser holder fixing screw.

## Setting the aperture diaphragm

The aperture diaphragm determines the lateral resolution, field depth and contrast of the microscope image. The best contrast is obtained when the apertures of the objective and the condenser are roughly the same. When the aperture diaphragm is stopped down to be smaller than the objective aperture, resolving power is reduced, but the contrast is enhanced. A noticeable reduction in the resolving power is observed when the aperture diaphragm is stopped down to less than 0.6x of the objective aperture and should be avoided where possible.

## Brightfield illumination with condenser

### 0.30 S70

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

## Brightfield illumination with condensers

### 0.53 S23 and 0.90 S1

Brightfield illumination is possible with condenser 0.53 S23 with objective magnifications from 5x to 100x, and with condenser 0.90 S1 from 10x to 100x. A P 1.40 OIL S1 condenser top is available for extremely high resolution.

## Setting Koehler illumination

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

- Engage the condenser disc into the “H” = Hellfeld = brightfield position if necessary.
- Close the field diaphragm.
- Adjust the height of the condenser until the edge of the field diaphragm is sharply in focus and also:

Centre the image of the field diaphragm in the middle of the field of view with the two centring screws.

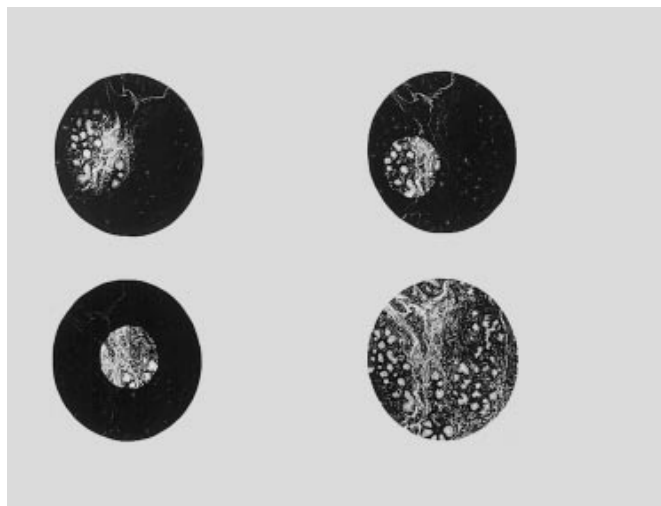
Open the field diaphragm until it just disappears from the field of view.

When objectives are changed, the condenser centration may have to be slightly adjusted with the knurled screws and the field diaphragm reset.

The field diaphragm protects the specimen against unnecessary heat and keeps all light not required for imaging away from the specimen, thereby enhancing contrast.

**Fig. 61** Koehler illumination

**a** Field diaphragm closed, not focused, not centred, **b** Field diaphragm focused, but not centred, **c** Field diaphragm focused and centred, but diameter too small, **d** Diameter of field diaphragm = diameter of field of view (Koehler illumination)



Therefore it is only opened wide enough to just illuminate the observed or photographed object field. A change in magnification always necessitates adjustment of the field diaphragm.

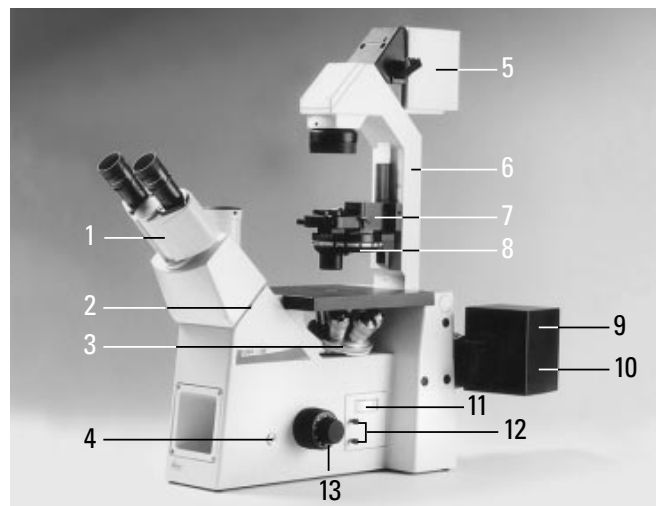
- Narrow the aperture diaphragm until you obtain the desired image contrast.



The aperture diaphragm determines the lateral resolution, field depth and contrast of the microscope image. The best contrast is obtained when the apertures of the objective and the condenser are roughly the same.

**Fig. 62**

**1** Binocular observation and phototube, **2** Tube clamp screw, **3** Objective nosepiece, sextuple, **4** Clamp screw for SLR/TV adapter, front port, **5** Transmitted light lamphousing, **6** Transmitted light illumination column, **7** Condenser holder, **8** Condenser 0.53 S23 with disc, **9** Screw for opening lamphousing 105, **10** Lamphousing 105, **11** Adjustment wheel for tube lens 1x, 1.5x or Bertrand lens (B), **12** Beamsplitter switch rods, **13** Coarse and fine focus





Visual comparison of the objective and condenser apertures is done as follows: remove an eyepiece from the eyepiece tube, or engage the Bertrand lens by turning the knurled wheel (62.11), (pos. B) and focus with the lever (62.11). Close or open the aperture diaphragm until the image just shows up in the pupil (= brighter circle) of the objective. This is regarded as the standard setting, i.e. condenser aperture = objective aperture.

Replace the eyepiece or disengage the Bertrand lens.

For low-contrast specimens, the aperture diaphragm can be narrowed further for clearer imaging of fainter structures. In polarisation microscopy, narrowing the aperture diaphragm usually results in stronger colours.



**n. b.:**

The aperture diaphragm in the **illumination light path** is **not** for adjusting image intensity. Only use the brightness adjustment knob or neutral density filters for this.

An aperture diaphragm in the objective is normally opened fully. Narrowing it reduces the intensity and

- increases field depth
- reduces coverslip sensitivity
- creates a darkfield impression
- alters contrast

### **Possible errors**

Wrong coverslip thickness or wrong objective. Specimen with coverslip at the top instead of the bottom.

Aperture diaphragm opened too far or closed.

Condenser at wrong height.

Light ring switched in by mistake.

Dirty optics.

# Operation of phase contrast

## Phase contrast observation

Like transmitted light darkfield and transmitted light interference contrast, phase contrast is used to produce high-contrast images of unstained specimens.

## Setting phase contrast with condenser 0.30 S70

Phase contrast observation is possible with objective magnifications from 5x to 40x.

Turn a phase contrast objective (engraving e.g. PH2) of the lowest magnification into the light path and focus the specimen. If it is difficult to find the focal plane: temporarily narrow the aperture diaphragm or use a stained specimen and switch the disc to pos. H (= brightfield).

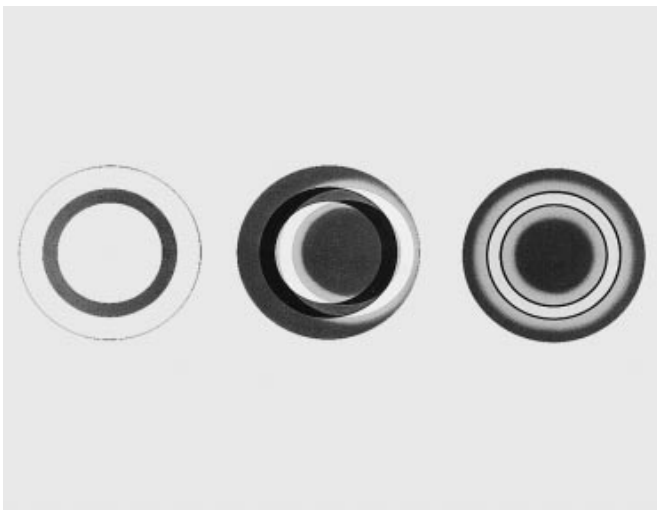
Set the light ring (64.2) in the condenser disc that corresponds to the objective engraving (PH2). Open the aperture diaphragm (= pos. PH). Move the Bertrand lens into the light path = pos. B by turning the knurled knob and focus the annular structures with the lever (Fig. 64).

Insert the two supplied centring keys into the openings of the disc on the left and right of the label plate (e.g. 3) (Fig. 64.2) and turn them until the dark ring (phase ring in the objective) coincides with the slightly narrower ring (light ring in condenser).

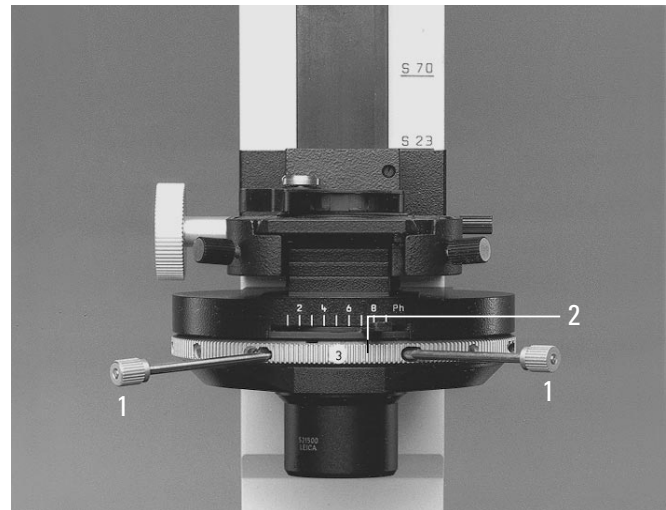
Then repeat the centration process for the other objective/light ring combinations. Disengage the Bertrand lens, pos. 1x.

**Fig. 63** Centration for phase contrast, viewing with a Bertrand lens

**a** Condenser in brightfield position (H), **b** Condenser in PH position, light ring LR not centred, **c** Light ring and phase ring centred



**Fig. 64** Centration process for phase contrast/DF  
1 Centring keys in working position, 2 Disc



### **Setting phase contrast with condensers 0.53 S23 and 0.90 S1**

Phase contrast observation is possible with condenser 0.53 S23 with objective magnifications from 5x to 100x, with condenser 0.90 S1 from 10x to 100x.

For both condensers, phase contrast is set as described as for the 0.30 S70 condenser. However, before the centration process itself, correct Koehler illumination must be set.

### **Possible errors**

Specimen: too thick, too thin, staining too intense; refractive index of mounting medium and specimen identical, so there is no phase jump.

Specimen slide too thick, so Koehler illumination not possible.



Wedge-shaped coverglass position, so centration of light and phase ring is no longer effective.

Wrong light ring, or light ring has been put in the disc upside down.

Aperture diaphragm not open.

Light ring not centred.

Wrong light ring.

# Operation of transmitted light darkfield

## Darkfield observation

Darkfield observation is not possible with condenser 0.30 S70, with condenser 0.53 S23 it is possible from 5x objective magnification, the max. usable objective aperture is 0.40. With condenser 0.90 S1, DF observation is possible from objective magnification 10x, the max. usable objective aperture is 0.75.

Objectives with higher apertures can be used if it is possible to reduce the aperture with a built-in iris diaphragm. These objectives can be recognised by the fact that the maximum and minimum apertures are given in the objective engraving and in our lists, e. g. 1.30 – 0.60.

Rotate the condenser disc to the H position (= brightfield). Focus the specimen (5x/10x objective). If the specimen plane is difficult to find, temporarily close the aperture diaphragm. Set Koehler illumination, open the aperture diaphragm as far as the stop (= pos. PH) and turn the disc to position D (= darkfield diaphragm).

If the specimen does not appear against a dark background, centre the DF diaphragm with the centring keys. To do this, insert them in the openings in the disc on the left and right of the label plate for the DF diaphragm (D) (64.2) and rotate until a homogeneous dark specimen background is produced.

# Operation of transmitted light polarisation

## **DL polarisation**

Polarisation contrast for examining birefringent specimens is possible with condenser 0.30 S70 with objective magnifications from 2.5x to 40x, with condensers 0.53 S23 or 0.90 S1 from 5x or 10x to 100x. A P 1.40 OIL S1 condenser top is also available for extremely high resolution.

## **Crossing the polarisers**

First: Set Koehler illumination. Remove the specimen from the light path; remove the Bertrand lens and fluorescence filter cube if necessary; turn the condenser disc and turret for objective-side IC prisms to pos. H.

Insert the polariser into the filter holder with the engraving facing upwards. Turn the filter holder to the right into the light path.

Push the analyser into the 2nd clickstop position in the microscope with the engraving ICT facing upwards.

Set the optimum extinction position by rotating the polariser and watching the empty field of view. Put a specimen on the stage.

For Pol colour contrast, the ICT analyser can be turned over, with the lambda engraving facing upwards, to activate a whole-wave compensator.

# Operation of transmitted light interference contrast

## **TL interference contrast**

TL interference contrast observation is possible with condenser 0.30 S70 with objective magnifications from 10x to 40x, with condensers 0.53 S23 or 0.90 S1 from 10x to 100x. For objective 100x there is also a condenser top P 1.40 OIL S1 for extremely high resolution.

## **Crossing the polarisers**

Remove the Bertrand lens and fluorescence filter cube from the light path if necessary; turn the condenser disc and turret for objective-side IC prisms to pos. H. Focus the specimen (20x objective). Set Koehler illumination exactly (not needed for condenser 0.30 S70). Remove the specimen from the light path.

Insert a polariser into the filter holder with the engraving facing upwards.

Turn the filter holder to the right into the light path.

Push the analyser into the 2nd clickstop position in the microscope with the engraving ICT facing upwards.

Set the optimum extinction position by rotating the polariser and watching the empty field of view.

## Centration of the condenser prisms

If you have ordered a complete microscope, this adjustment will already have been made at the factory. However, it is advisable to check the centration from time to time, particularly after transport: disengage the objective-side IC prisms (pos. H).

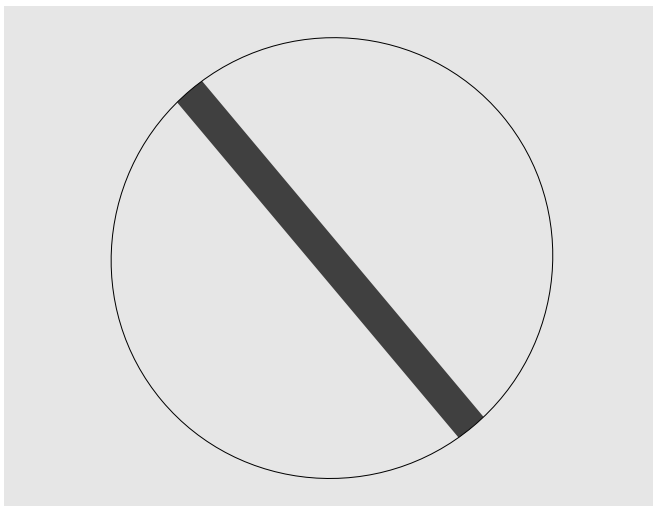
Remove an eyepiece from the eyepiece tube. Engage the condenser-side IC prisms one after the other (the whole-wave compensator must not be active, i. e. the lambda engraving is on the bottom side of the analyser). When the centration is correct, the dark stripe must be in the centre of the pupil (= brighter circle) of the objective (Fig. 65).

If not, proceed as follows:

Put one of the supplied centring keys in the disc opening on the left of the label plate for the IC prism (e. g. 64.2) (Fig. 65) and turn it to centre the stripe.

**Fig. 65**

Objective pupil with correctly centred compensation stripe



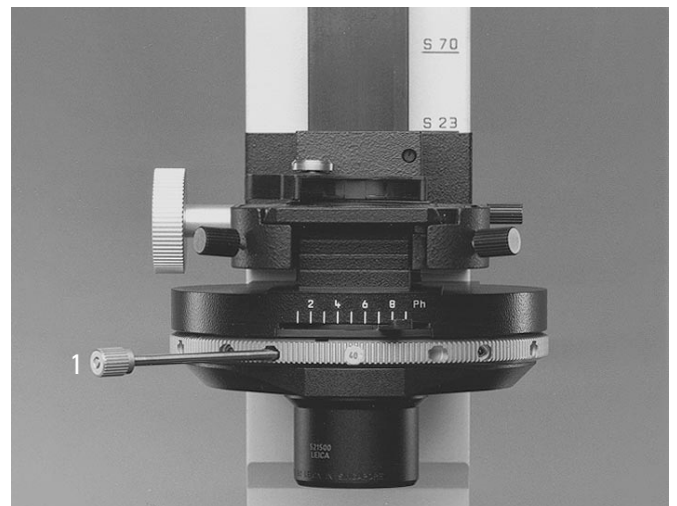
## Objectives for ICT

Transmitted light interference contrast is possible with the brightfield and phase contrast objectives which have the code letter of the pupil position in the first line of engraving, e. g. A (see separate objective chart).

An IC condenser prism, e. g. K6, must also be available for the objective. An up-to-date table of possible prism combinations (objective chart) is enclosed separately with each configuration.

**Fig. 66** Centration for interference contrast

**1** Centring keys in working position



## Choice of prisms

Choose the objective-side prism with the letter indicated in the top line of the objective engraving, e.g. C for pupil position C, by rotating the turret.

Choose the condenser-side prism that corresponds to the magnification of the objective used, e.g. pos. 40 for objective 40x, by rotating the disc.

## Setting ICT contrast

Turn the objective-side prism turret to the left and right (Fig. 67). Also adjust the contrast with the aperture diaphragm. Optimum contrast for specimens with parallel structures can be obtained by rotating the specimen. Colour contrast: Turn over the analyser, so that the lambda sign can be seen on the top.

## Sources of error if ICT image quality is unsatisfactory

Embedding medium, specimen slide (petri dish) or specimens (e.g. crystals, fibres) are of birefringent material. The phase shifts caused by birefringence disturb the interference contrast image. This can sometimes be remedied by rotating the specimen.

**Fig. 67**  
Setting ICT contrast





# Operation of incident light fluorescence



**n. b.:**

Only with microscope with integrated incident light fluorescence axis.

## Fluorescence observation

Focus the specimen in transmitted light first, if possible (perhaps Phaco or ICT).

Select a filter cube to suit the excitation and emission spectrum of the specimen and move into the light path by rotating the turret. Open the iris diaphragm of the objective.

Switch the magnification changer\* (on the DM IRB-SLR and DM IRBE versions) by turning the knurl to pos. 1x. Switch off the transmitted light illumination.

Open the incident light path. The switch rod should be pulled out fully.

If the background is too red, engage a BG 38 filter. Push the switch rod in halfway.

The BG 38 filter should always be used for photography.

When not looking through the microscope, always block the incident light path to prevent specimens fading. Push the switch rod in all the way.

The 3 clickstop positions of the switch rod mean:

Switch rod

- Stop ●  Incident light path blocked (light stop)
- BG 38  BG filter engaged
- Incident light path open

## 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 (Fig. 68)

3 alternative centration methods:

#### Method 1:

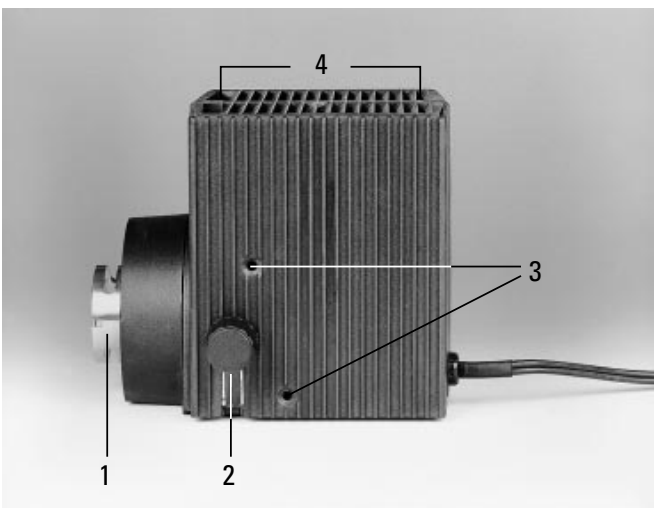
##### Centration with a centring aid

On the right side of the microscope there is an adjustment window showing an image of the light source. The reflector for lamp adjustment is inserted in the filter turret instead of a filter cube and turned into the light path.

Centre the lamp as described for method 2 while watching the light source in the adjustment window.

**Fig. 68** Lamphousing 107 L

**1** Cover fixing screws, **2** Screw for horizontal adjustment, **3** Screw for vertical adjustment, **4** Collector focusing



#### Method 2:

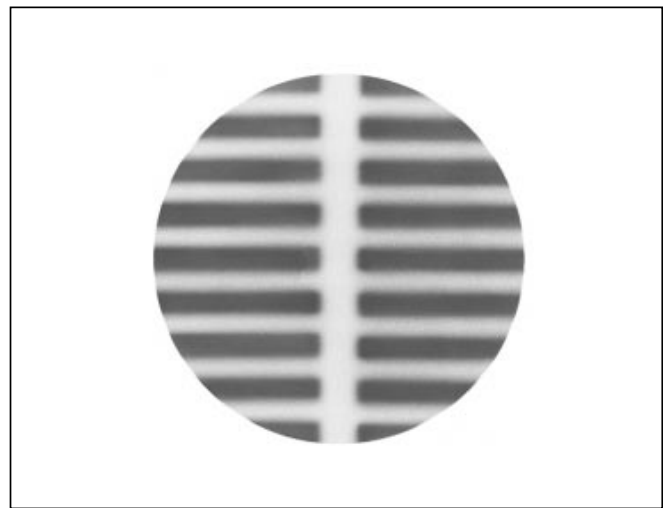
##### Centration in the rear focal plane of the objective

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 + 72.3).
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 (Fig. 69).

Please note that only the central area of the filament can be seen and that the image is very low in contrast.

**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°.



- Using an Allen key, adjust the screw for horizontal adjustment (68.3) until the pale stripe of the filament image is in the centre of the pupil.
- Then adjust the screw for vertical adjustment (68.2) to align the filament image vertically in the centre of the pupil.

### Method 3:

#### Centration in the plane of the specimen stage

- 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.
- Set the field and aperture diaphragms at the middle position.
- 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.
- Screw out the objective or turn an empty nosepiece position into the light path.

- 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 2.

#### Lamphousing 106 z L with halogen lamp, Xe and Hg lamps

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

For lamphousing 106 z 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

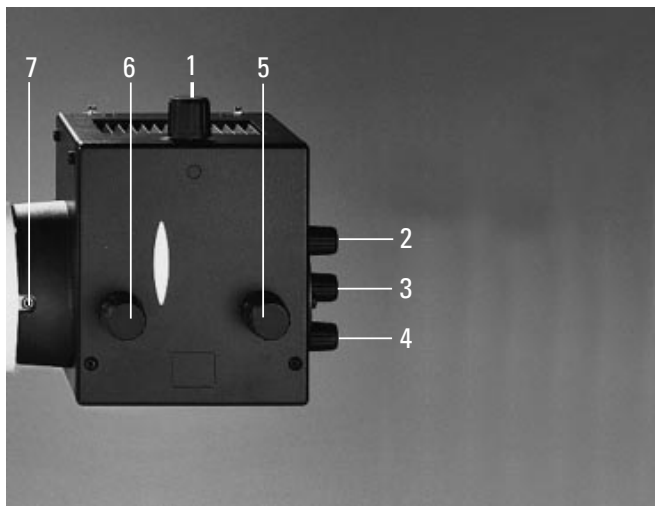
Move the reflection of the filament to the side or entirely out of the light path by adjusting the centring screws on the back of the lamphousing (70.5, 71). Focus the direct image of the filament with the collector adjustment (70.1)

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 (Fig. 71b).

Then focus the reflection of the filament with the centring buttons for the reflector adjustment and align symmetrically to the direct image (Fig. 71c).

**Fig. 70** Lamphousing 106 z with Hg 100 W lamp

**1** Lamp adjustment, vertical, **2** Reflector adjustment, vertical, **3** Focusing of the reflector image, **4** Reflector adjustment, horizontal, **5** Lamp adjustment, horizontal, **6** Collector focusing, **7** Cover fixing screw



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



**n. b.:**

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

### Centration of Xe or Hg gas discharge lamps

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 lamp-housing (70.2, 70.3, 70.4).

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. Then focus the reflection (70.3) and, using the centring buttons of the mirror adjustment (70.2, 70.4), move the reflection until it is symmetrical with the direct image (Fig. 71c).

### Hg 100 W and Xe 75 W lamps

Using the centring buttons (70.1, 70.5) 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 (Fig. 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.

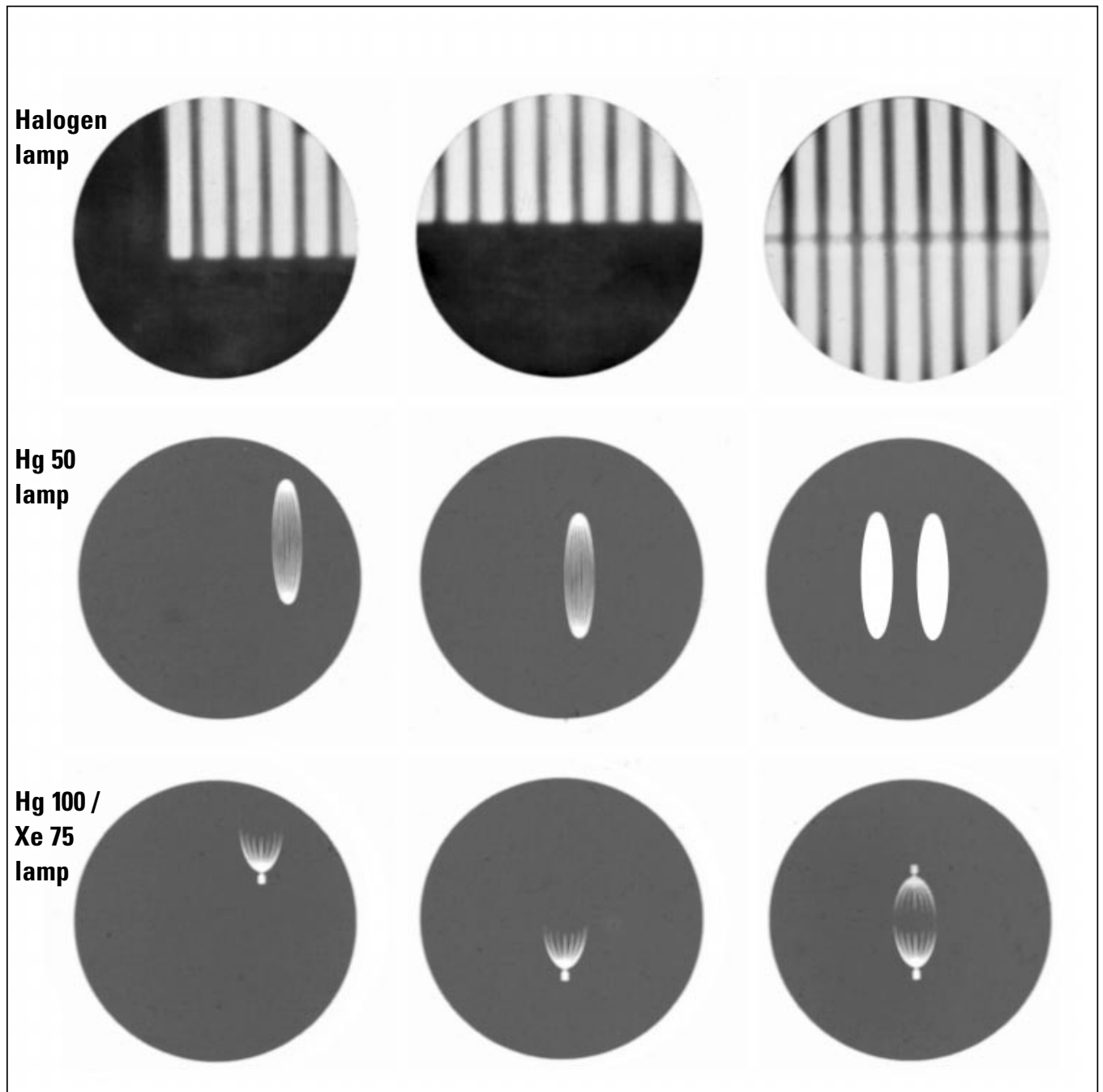
**Fig. 71**

Schematic diagram of the lamp centration in lamphousing 106 z (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



## Centring the aperture diaphragm

Turn a low to medium objective magnification 10x/20x into the light path and focus a specimen with the coarse and fine drive.

Remove an eyepiece from one of the two eyepiece tubes and look into the empty tube or move the Bertrand lens into the light path.

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 specimen 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.

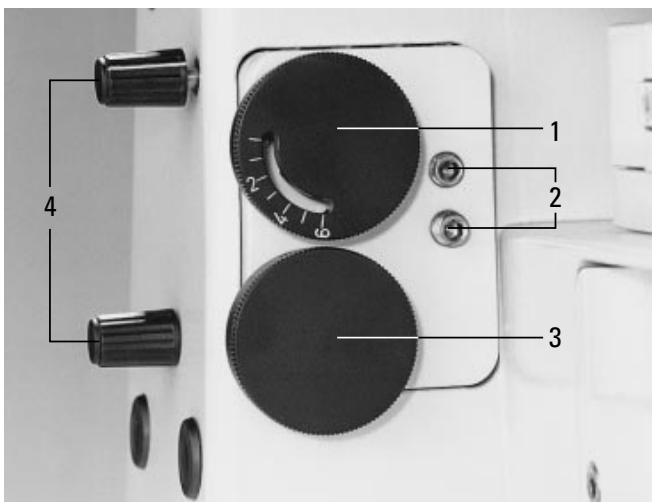
Normally, the field diaphragm is opened until it just disappears out of the field of view.

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



## **Possible errors**

### Weak fluorescence, insufficient brightness:

Wrongly stored, overaged or faded specimens.

Fast fading of the specimens (e. g. for FITC).

Unspecified filter combination.

Numerical aperture of the objective too low.

Eyepiece magnification too high.

Spent lamp.

Room too bright.



Trinocular tube: wrong beamsplitter setting.

Stray light due to reflections at the condenser.

### Low-contrast image due to:

Excitation bandwidth too wide.

Inspecific staining.

Fluorescing mounting medium.

Autofluorescence of objective or immersion oil.

Glass surfaces dirty.

# Operation of filters

## Light filters

Up to max. 3 light filters can be inserted in the filter holder (1.16). They can be switched in and out the light path as required.

Filter	Use
Grey filter	Grey filters (neutral density filters) are used to attenuate the light without influencing the colour temperature. The engraved value, e.g. N16, indicates the attenuation value. So N16 means reduction to $1/16 = 6.3\%$ transmission.
Green filter, panchromatic	for general enhancement of contrast in black-and-white photography.
DLF	Conversion filter for colour photography with daylight film.
ALF	Enhances contrast for colour photography with artificial light film.
VG9 (green filter )	Contrast enhancement for chromosome photography.



# Operation of the slide overlay device

## Slide overlay device

The slide overlay device is used for reflecting measurement and comparison patterns,  $\mu\text{m}$  marks, marker arrow, company logo and quality data etc. into the microscope image so they appear on the photograph.

Slides with the following line patterns are available:

- Marker arrow
- Measurement  
scale 10 mm = 100 divisions
- $\mu\text{m}$  marks for 2.5x – 100x objectives
- 10 x 10 mm grid division

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, i. e. white line patterns on a dark background, preferably using fine-grain document film, and then framed in a customary 50 x 50 mm slide frame.

The original is imaged 2 : 1 in the intermediate image plane of the microscope. A distance of e. g. 5 mm in the slide overlay is enlarged to 10 mm in the intermediate image plane of the microscope.

The overlay is only possible in beamsplitter position 50/50 (switch rod) in the middle position of the tube (FSA 25 PE).

The framed slide is inserted in the fitted slide holder (74.6), with the lettering on the white side of the slide facing the lamp.

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

The white line pattern can be given a coloured background by inserting 32 mm colour filters in the filter slot (74.7).

# Operation of the macro device

Like the slide overlay device, the macro overlay (Fig. 73) 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 (73.11) and illuminated.

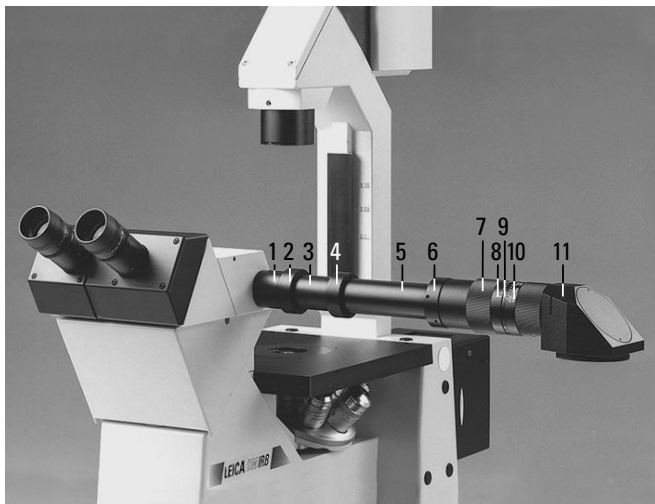
Stand lamps, cold-light illuminators and fibre-optic lamps, etc. are suitable sources for microscopy.

The image is observed in the microscope tube and focused by turning the knurled ring (73.10).

The magnification can be changed continuously in a range of 1:4 by adjusting the zoom ring (73.7).

When changing the magnification with the zoom control the image has to be slightly refocused with the knurled ring (73.10). The zoom magnification factors can be read on the scale (73.8). The magnification also changes when the distance between the object and the macro attachment is varied.

**Fig. 73** Macro device on FSA 25 PE tube with tube adapter  
**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 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 (73.11) 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.

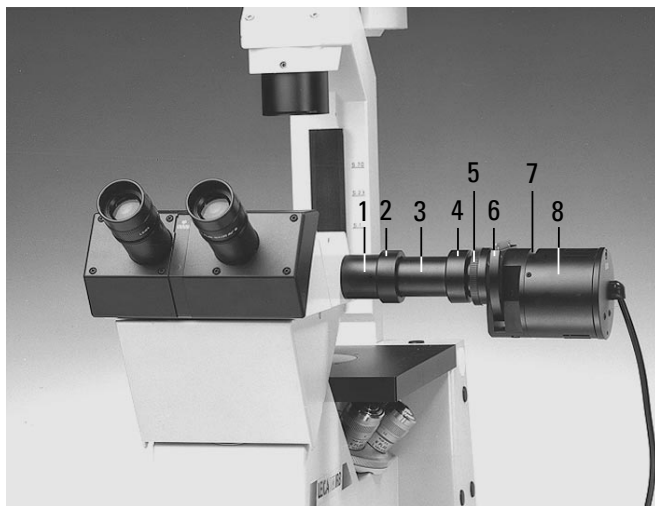
The intermediate image magnification  $M_1$  of the macro object can be worked out from the eyepiece field of view and the diameter of the object field (measured with a graduated ruler) as follows:

$$M_1 = \frac{\text{field of view } \varnothing}{\text{object field } \varnothing} \quad \text{e. g.} \quad \frac{10\text{x}/20 \text{ eyepiece}}{\text{object field} = 200 \text{ mm}} \quad M = 0.1$$

**Fig. 74**

Slide overlay on the FSA 25 PE tube (with tube adapter)

**1** Tube flange, **2** Coupling ring of reflection optics, **3** Reflection optics, **4** Coupling ring of slide overlay device, **5** Knurled focusing ring, **6** 5 x 5 cm slide holder, **7** Filter slot, **8** Illumination adapter of lamphousing



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

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 0.1x  
photo projection lens 10x  
camera factor 35 mm 0.32x  
 $0.1 \times 10 \times 1.32 = 0.32x$

The total magnification at the 35 mm camera of the ORTHOMAT® E is therefore 0.32x.

**Fig. 75** Transformer



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 (73.9), e. g. 0.11x)
- Zoom factor (scale (73.8), e. g. 1x)
- Correction factor of the reflection optics (without engraving 1.17x)
- Eyepiece magnification (e. g. 10x)  
e. g.  $0.11 \times 1 \times 1.17 \times 10 = 1.29$

The total magnification in the eyepiece would therefore be 1.29x.

#### 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.

## Length measurements

The following components are required for length measurements:

- Graticule with scale in eyepiece (Fig. 76) or in the slide overlay device (Fig. 74).
- Transmitted light stage micrometer for calibration.

Before measurement, the micrometer value of the objective/eyepiece combination must be known, i. e. the distance in the specimen that corresponds to a scale interval in the graticule you are using.

Calibration:

Align the stage micrometer and the graticule parallel to one another by rotating the eyepiece and adjust the zero marks of the two scales to exactly the same height (Fig. 76).

Read how many scale divisions of the stage micrometer correspond to how many on the microscope scale (graticule) and divide the two values.

Example:

If 1.220 mm of the stage micrometer corresponds to 100 divisions of the measurement scale, the micrometer value is  $= 1.220 : 100 = 0.0122 \text{ mm} = 12.2 \text{ }\mu\text{m}$ . For extremely low objective magnifications it may be that only part of the measurement scale can be used for calibration.

Important: If using a magnification changer\* (DM IRB-SLR and DM IRB/E stands):

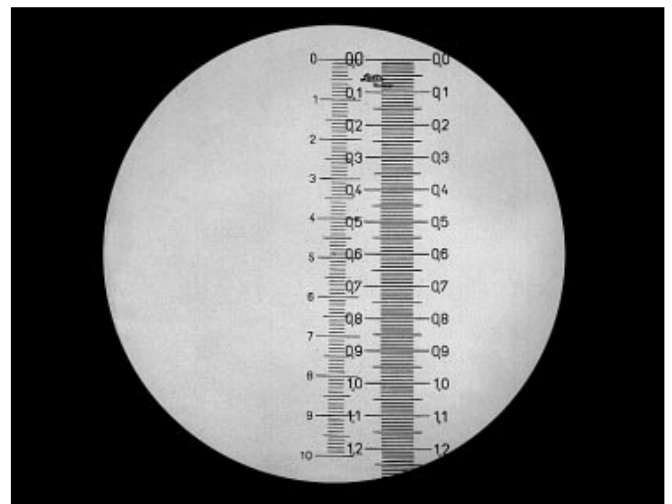
Remember to take the additional magnification value into consideration separately instead of extrapolating the micrometer values of the other objectives from the calibration of one objective. Measurement errors may occur if the eyepiece is not pushed into the tube as far as the stop.

## Connections for TV cameras and photomicro equipment

All the variants of the Leica DM IRB stand have a photo/TV exit on the left side.

There are also photo/TV exits in the trinocular tubes for vertical adaption of camera systems.

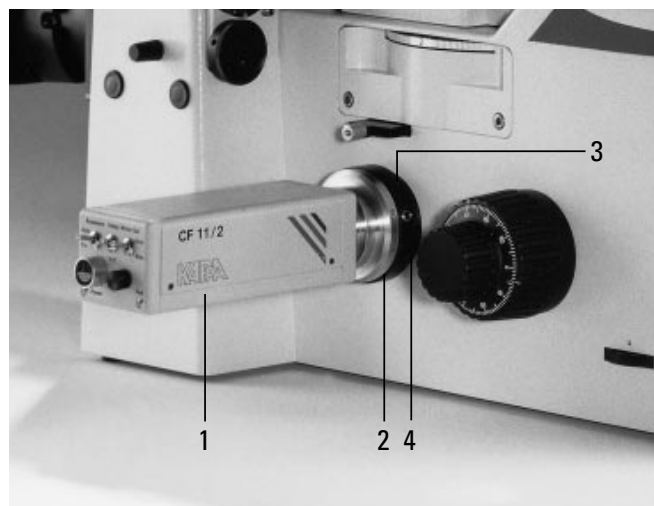
**Fig. 76** Graticule scale in the eyepiece (left) and image of the stage micrometer (right)



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

	Recorded picture diagonal in mm with				Order no.
	1 inch camera	$\frac{2}{3}$ inch camera	$\frac{1}{2}$ inch camera	$\frac{1}{3}$ inch camera	
<b>Without zoom magnification, for 1 chip cameras</b>					
c-mount adapter 1x HC	16	11	8	6	541 510
c-mount adapter 0.63x HC <sup>+) </sup>	–	17.5	12.7	9.5	541 537
c-mount adapter 0.5x HC	–	–	16	12	541 511
c-mount adapter 0.35x HC	–	–	–	17.1	541 512
c-mount adapter 4x HC <sup>+) </sup>	4	2.8	2	1.5	–
<b>Without zoom magnification, for 1 – 3 chip cameras</b>					
each in connection with 0.5x HC TV optics (screw connection)					
c-mount adapter 1x	–	–	16	12	541 706
B-mount adapter 1x	–	–	16	12	541 702
B-mount adapter 1.25x	–	17.5	–	–	541 539
F-mount adapter 1x	–	–	16	12	541 540
F-mount adapter 1.25x	–	17.5	–	–	541 541
<u>required for each:</u> TV adapter 0.5x HC					541 706
<b>With zoom magnification (Vario TV adapter)</b>					
c-mount, 0.32 – 1.6x HC	–	–	19 <sup>++)</sup> –5	18–3.8	541 517
B-mount, 0.5 – 2.4x HC (SONY)	–	–	16–3.3	–	541 518
<sup>+) </sup> in preparation <sup>++)</sup> from zoom factor 0.42x only!					

**Fig. 77** 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



## Calculation of the magnification on the monitor

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

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

## Beamsplitting for photomicrography or TV microscopy

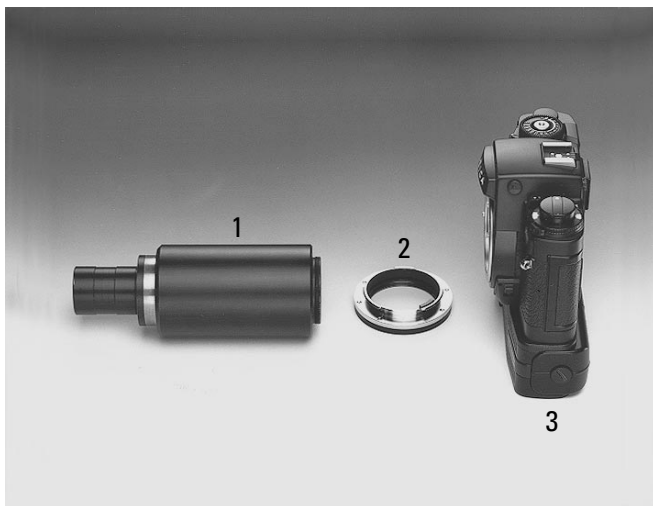
DMIRB with side photo port only and correspondingly with one beamsplitter switch rod (81.1).

- Image recording via phototube:  
Switch rod pushed in = 100 % light to the tube (82.1).
- Image recording via side photo port:  
Switch rod pulled out = 80 % light to the side port and 20 % light to the tube (82.2).

DMIRB with side photo port and front port (DMIRB-SLR) and correspondingly two beamsplitter switch rods (81.1 and 81.2).

- Image recording via phototube or side port:  
Use the upper switch rod (81.1) as for the version with side photo port only.  
Push the lower switch rod (81.2) in (82.3 and 82.4).
- Image recording via front port\* (SLR/TV) or phototube:  
Upper switch rod (81.1) pushed in, lower switch rod (81.2) pulled out = 50 % light to the front port and 50 % to the tube (82.5).

**Fig. 78** Adaption of the front port for the SLR camera  
1 SLR adapter, 2 T2 connector ring, 3 SLR camera



**Fig. 79** Adaption of the front port for TV camera  
1 TV adapter 0.63x, 2 TV camera with c-mount thread





**n. b.:**

### Long-term video microscopy

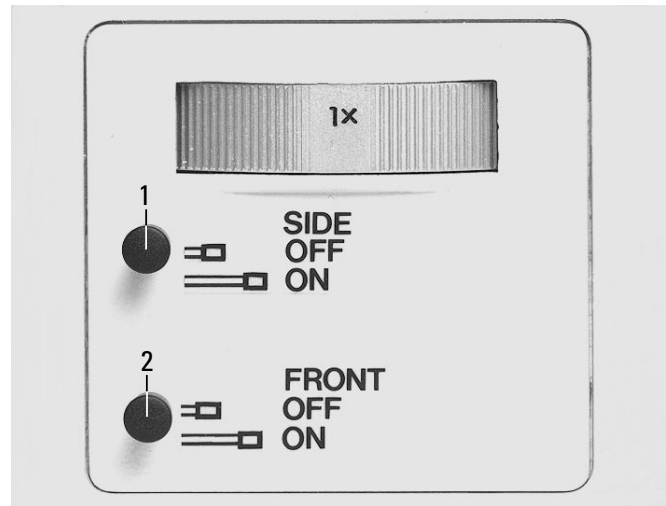
The solid and therefore stable basic body of the stand takes a while to stabilise thermally after the microscope is switched on. For investigations taking over > 30 min. therefore, the microscope should be switched on about 1 – 2 hours beforehand.

**Fig. 80** Leica DM IRB, equipped with three TV cameras



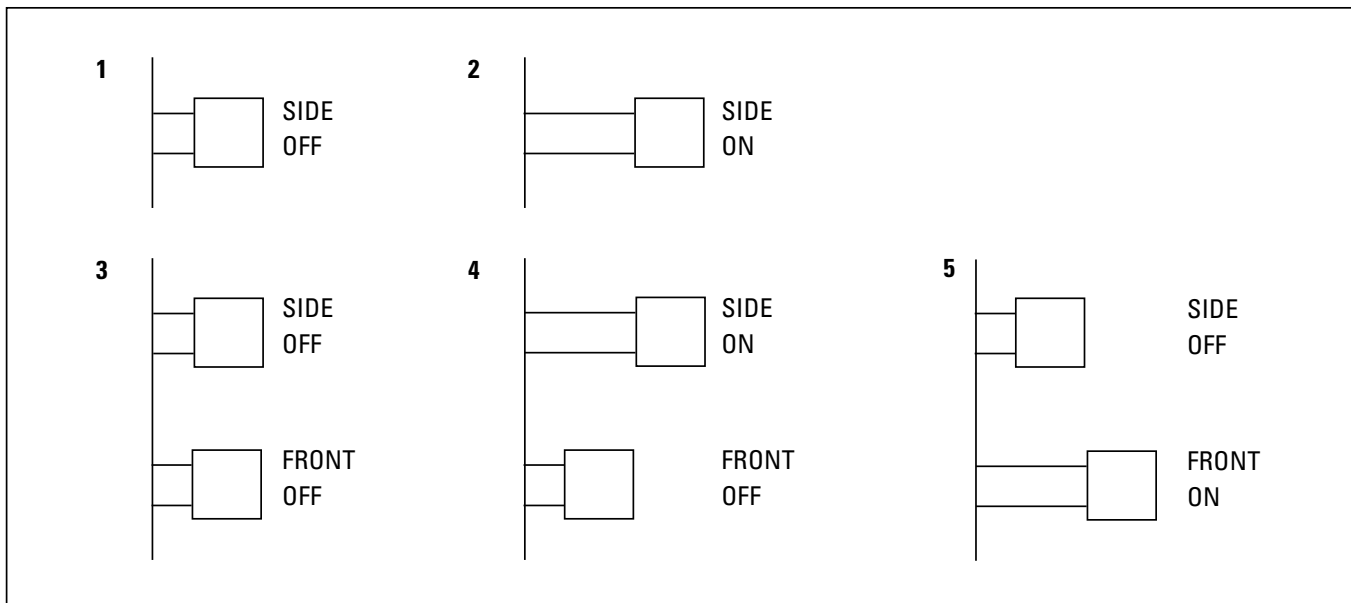
**Fig. 81** Switch rods for beamsplitting

**1** Upper beamsplitter switch rod (SIDE), **2** Lower beamsplitter switch rod (FRONT)



**Fig. 82** Beamsplitting

**1** 100 % light to the tube, **2** 80 % light to the side photo port, 20 % to the tube, **3** 100 % light to the tube, **4** 80 % light to the side photo port, 20 % to the tube, **5** 50 % light to the front port, 50 % to the tube





# Operation of LMC

Leica modulation contrast (LMC) is a special form of oblique illumination based on the principle of Hoffmann modulation contrast.

In this technique, the phase gradients of an unstained specimen are converted into differences in amplitude with the aid of a modulator.

This gives a three-dimensional impression similar to an interference contrast image. Unlike interference contrast, however, the specimen can be observed through birefringent plastic materials such as petri dishes.

Further advantages of this technique are:

- high contrast
- high resolution
- halo-free, high-contrast relief image
- long free working distance of the condenser
- easy assembly and adjustment
- use for both stained and unstained specimens.

# Principle of LMC

## The principle

Leica modulation contrast (LMC) is based on the principle of Hoffmann modulation contrast.

This imaging technique is particularly suitable for unstained, colourless objects with little image contrast.

Such objects change the phase of the light when it passes through them.

The conversion of these phase gradients into differences in amplitude results in a three-dimensional image similar to that of differential interference contrast.

To realise this technique, a light slit diaphragm and an objective with integrated modulator are required. The modulator is a filter built into the rear focal plane which divides it into three zones, a dark zone, a grey zone and a light zone.

The light coming from the light slit diaphragm is diffracted at the object into different directions, depending on the object's refractive index gradient, so that some of the rays have to pass through the light zone of the modulator and some through the dark zone. The non-diffracted direct light passes through the grey zone and produces the grey background of the entire field of view. Most of the rays diffracted at the object pass through the light zone and produce the image.

If the condenser is set at the "brightfield" position and the specimen is removed, the dark and the grey zone can be seen at the edge of the field of view. The image of the slit diaphragm is in the light zone. To adjust, the light slit diaphragm is rotated until the bright stripe of the slit image covers the grey stripe of the modulator.

# Components

## The components

LMC consists of the following components:

### S40/0.50 LMC condenser

The condenser (order no. 521 225) is supplied with a condenser disc to accommodate 3 LMC diaphragms, plus two phase contrast light rings and a brightfield position (3x LMC, PH1, PH2, brightfield).

Adhesive labels are enclosed for labelling the individual positions.

In the front focal plane of the condenser a light slit diaphragm has already been assembled in each of the LMC positions, corresponding to the supplied objectives.

## LMC objectives

The following objectives are available:

C PLAN 10x/0.22 LMC  
C PLAN L 20x/0.30 LMC  
C PLAN L 40x/0.50 LMC  
N PLAN L 20x/0.40 CORR LMC  
N PLAN L 40x/0.55 CORR LMC  
PL Fluotar L 63 x/0.70 CORR LMC

In the rear focal plane of the objectives a special modulator, similar to the phase contrast rings, has been fitted.

When unpacking, check that you have all the components.

# Assembly/adjustment

## Assembly

When taking the following steps, consult the manual for the Leica DM IRB/E manual.



**n. b.:**

**Before installing the LMC components, remove the field diaphragm. Also remove any filters, prisms and interference contrast components.**

Screw the LMC objectives into the objective nosepiece.

Replace the condenser on the microscope with the S40/0.50 LMC condenser. First check that the inserted light slit diaphragms match the objectives in the nosepiece. The light slit diaphragms are labelled, for example, LMC 10, LMC 20 or LMC 40.

Example: **LMC 10** diaphragms belong to the C PLAN 10x/0.22 **LMC** objective.

The light diaphragms are usually assembled at the factory to match the supplied objectives. If the light slit diaphragms are supplied separately, they must be inserted in the positions in the condenser disc to match the objectives used.

## Adjustment

Open the aperture diaphragm on the condenser fully.

Switch on the light. Select a medium brightness setting.

Set the condenser to the **brightfield position** and turn the first LMC objective into the light path (usually the objective with the smallest magnification).

Engage the Bertrand lens using the adjustment wheel on the right side of the microscope.

You will now see the modulator built into the objective as a grey rectangle at the edge of the field of view. Its position (top, bottom, left, right) is not fixed and may vary for different objectives. Focus the image of the modulator using the Bertrand lens.

Turn the condenser to switch to the light slit diaphragm whose name corresponds to the engraving on the objective (e. g. LMV 10 for the C PLAN 10x objective).

You will now see a bright rectangle.

The light slit diaphragm is now adjusted until the bright stripe of the slit image is fully inside the grey stripe of the modulator. The light slit diaphragm can be rotated and moved in x and y direction.

For the 10x objective the image of the modulator and the light slit are virtually the same size. Adjust the light slit diaphragm until the bright slit lies near the dark edge.

Repeat this process for each objective.

Always make sure that the objective name and the name of the light slit diaphragm coincide.

Then disengage the Bertrand lens with the adjustment wheel on the right side of the microscope. Switch on magnification 1x or higher and put a specimen on the stage.

# Areas of application

On the Leica DMIRB/E microscope, LMC is particularly suitable for life science applications.

## **Use of birefringent materials**

Transparent, living cultures in petri dishes can be observed in three dimensions, for example.

## **Use of a micromanipulator**

The long free working distance of the S40/0.50 LMC condenser offers plenty of space for manipulation tools. The 3D image impression makes it easier to find suitable injection points.

## **Optical sectioning**

LMC produces a large, flat observation area. This makes it easier to focus a specific area for observation.

## **Avoidance of halo effects**

Phase contrast images are often spoiled by halo effects. These do not occur with LMC.

## **Use for fluorescing specimens**

Morphology of fluorescing and non-fluorescing specimens can be analysed without changing the objective or moving the specimen.

# Care and maintenance



**n. b.:**

Before cleaning and maintenance work, remember to disconnect from the mains!  
Protect electric components from damp!

Microscopes in warm and humid climates need special care to keep them free of fungus. The microscope should be cleaned every time it is used and the microscope optics should be kept immaculately clean.

## Dust protection



**n. b.:**

Protect the microscope and peripherals from dust by putting on the flexible dust cover after each work session.

## Cleaning



**n. b.:**

Fibre and dust residue can cause disturbing background fluorescence in fluorescence microscopy.

## Cleaning of lacquered components

Dust and loose particles of dirt can be removed with a soft brush or lint-free cotton cloth.

Obstinate dirt can be removed with any ordinary hydrous solution, benzine or alcohol. Use a linen or leather cloth moistened with one of these substances to clean lacquered components.



**n. b.:**

Do not use acetone, xylol or nitro dilution, which may damage the microscope.

Cleaning agents of unknown composition should be tested on an inconspicuous part of the microscope first. Lacquered or plastic surfaces must not be tarnished or etched.

## Cleaning the stage

Remove light spots on the stage by rubbing with paraffin oil or acid-free vaseline.

## Cleaning glass surfaces

Remove dust on glass surfaces with a fine, dry and grease-free hair brush, by blowing with a bellows ball or by vacuum suction.

Obstinate dirt on glass surfaces can be carefully removed with a clean cloth moistened with distilled water. If the dirt can still not be removed, pure alcohol, chloroform or benzine can be used instead of distilled water.

### Cleaning objectives



**n. b.:**

Objectives should not be screwed apart for cleaning. If there are signs of interior damage, send the objectives to your nearest Leica agency for repair. We also advise against cleaning the inner surfaces of eyepieces.

The front lenses of objectives are cleaned as described under "Cleaning glass surfaces". The top lens is cleaned by blowing off the dust with a bellows ball.

### Removal of immersion oil



**n. b.:**

Read the safety information for immersion oil!

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

### Acids, alkaline solutions

Particular care should be taken when working with acids or other aggressive chemicals.



**n. b.:**

Always avoid direct contact between such chemicals and the optics or stands.



# Troubleshooting

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) 64 41-29 28 49  
Fax (0) 64 41-29 22 66

Apart from preparation errors (e. g. staining or wrong specimen vessel), which cannot be dealt with in this manual, there are two main categories of error:

Mechanical errors and  
electric errors.

## Mechanical errors

We already mentioned possible mechanical errors in the "Installation" and "Operation" chapters.

These mainly involve errors in inserting contrasting equipment, maladjustment of light rings or the wrong condenser height setting.

We described all these possible errors in previous chapters.

Therefore, if you are not satisfied with the quality of the image, read the relevant sections of the manual.

## Electric errors

These may be:

1. The lamp on the microscope does not work.
2. There is no power.

Check the following possible causes:

### The on/off switch does not respond (no illumination):

- Check that all mains cables are properly connected.
- Make sure that there is power at the sockets you are using and that they are not deactivated by a mains switch.
- After you have ruled out the possibility of all possible external sources of error, check that a fuse of the Leica DM IRB or power unit is not defective.

### Replacing the mains fuse on the microscope



**n. b.:**

Call the Technical Service!

### The integrated transmitted light lamp does not respond.

- Make sure the plug of the lamp cable is firmly plugged into the corresponding socket on the back of the DM IRB stand.
- The halogen lamp may be faulty.

## Replacing the 12 V/100 W halogen lamp

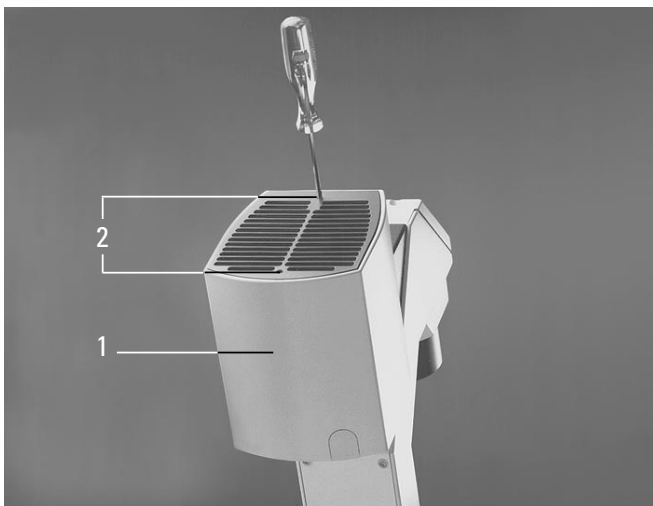


n. b.:

Remember to disconnect from the mains!  
Leave the protective cover on until the lamp is inserted. Avoid making fingermarks, or wipe off immediately.

- Switch off the microscope and the power unit (if used).
- Disconnect the appliance cable of the microscope and the power unit.
- Disconnect the transmitted light illumination column from the power supply on the back of the microscope.
- Screw off the lamphousing with a 3 mm Allen key.
- Remove the faulty lamp.

**Fig. 83** Lamphousing for transmitted light illumination  
1 Cover, 2 Cover screws



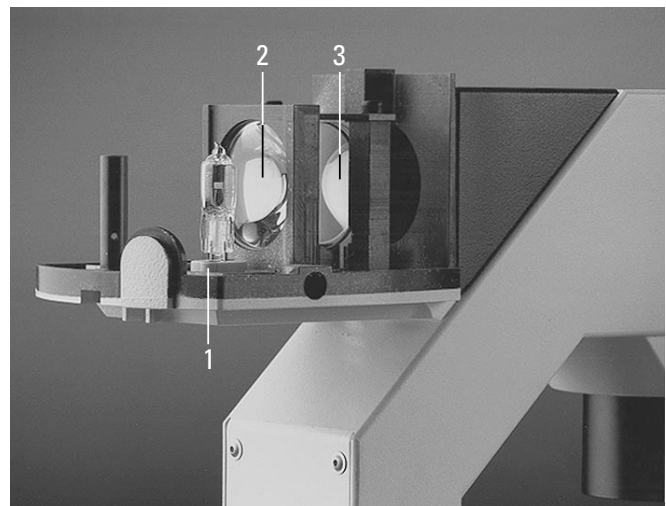
- Insert the new lamp as far as it will go into the sockets of the lamp holder.
- Mount the lamphousing and screw down with a 3 mm Allen key.
- Reconnect the transmitted light illumination column to the power supply on the back of the stand.
- Connect the microscope and, if used, the power unit to the mains.

### The additional fluorescence lamp does not respond.

- Make sure the cable connections lamp – power unit – mains are correct and complete. Possible causes for the failure of the fluorescence lamp are: a defect fuse of the power unit, a defect lamp or a defect burner in the lamphousing.

**Fig. 84** Lamphousing for transmitted light illumination (cover removed)

1 Lamp holder (pin base) with 12 V 100 W halogen lamp,  
2 Collector, 3 Heat protection filter



## Replacing the mains fuse on the power unit\*



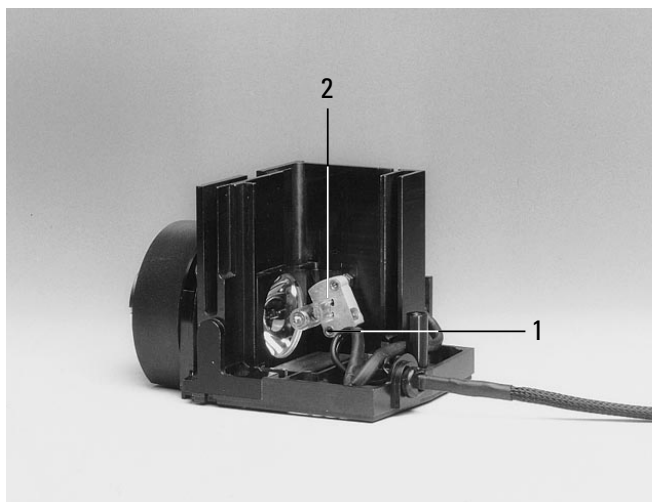
n. b.:

Remember to disconnect from the mains!

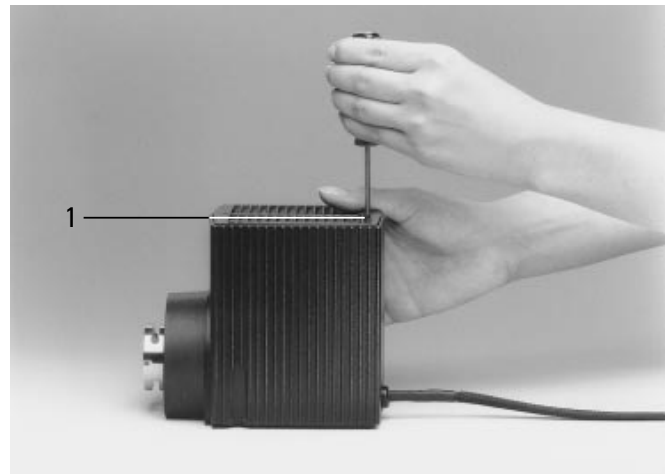
- Switch off the microscope and the power unit.
- Disconnect the appliance cable of the microscope and the power unit.
- Remove the defect fuse from the fuse holder. Replacement fuses of IEC 127-2 standard and/or UL 198 G and/or company type:

Part no.: 846-205.000-00  
Name: T 4 A  
Wickmann 19 195/  
Schutter FST

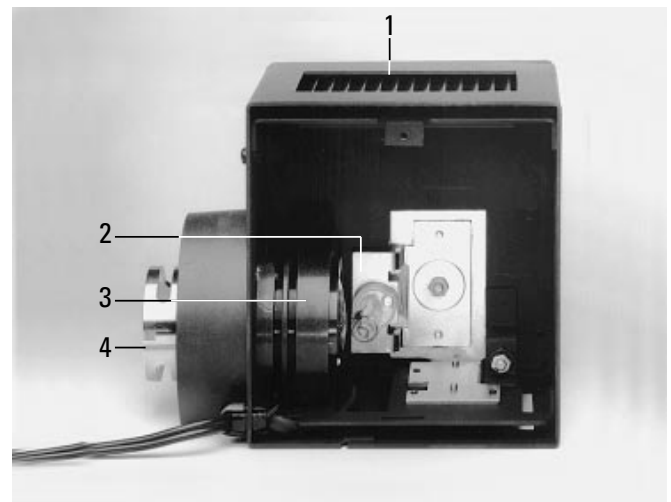
**Fig. 86** Lamphousing 107/2, opened  
1 Collector, 2 Holder with 12 V 100 W halogen lamp



**Fig. 85** Lamphousing 107/2  
1 Screw for opening the lamphousing



**Fig. 87** Lamphousing 106, opened  
1 Screw for opening the lamphousing, 2 Holder with 12 V 100 W halogen lamp, 3 Collector, 4 Diffusing disc





**n. b.:**

Never use fuses with a different rating from the ones specified.

- Connect the microscope and the power unit to the mains.

### Replacing the 12 V / 100 W halogen lamp in lamphousing 106, 107, 107/2

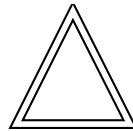
Ask a member of Leica field staff to show you how to change the halogen lamp properly. Here again are all the necessary steps:



**n. b.:**

Always disconnect external transformers and the microscope from the mains when carrying out assembly work!

- Switch off the microscope and the power unit.
- Disconnect the appliance cable of the microscope and the power unit.
- Slacken the clamp screw on the microscope and remove the lamphousing.
- Slacken the screw (85.1) on the lid and remove the lid.
- Move the collector (84.3) to the front if necessary.

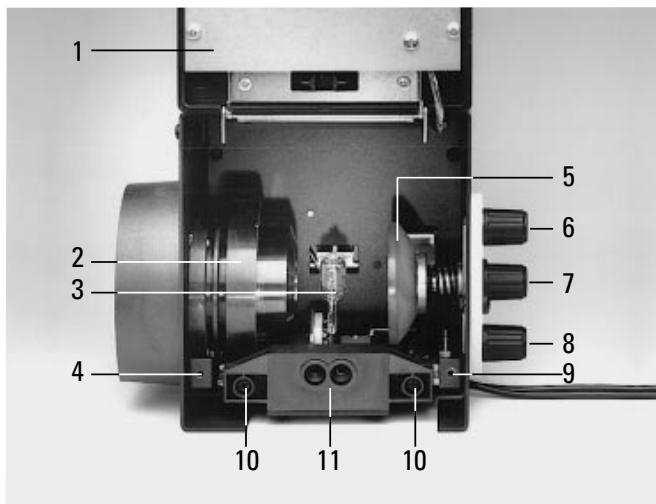


**n. b.:**

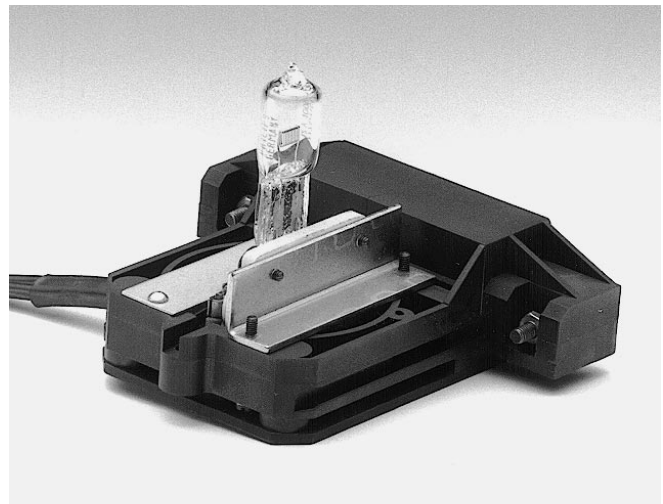
This step is not necessary with lamphousing 107/2.

**Fig. 88** Lamphousing 106 z, opened

1 Lid, flipped up, 2 Collector, 3 12V 100W halogen or gas discharge lamp, 4, 9 Screw holes for lid, 5 Reflector, 6, 8 x-y adjustment screws for centration of reflector, 7 Reflector focusing, 10 Fixing screws for lamp holder, 11 Socket for cut-out plug



**Fig. 89** 12V 100 W lamp holder





**n. b.:**

Leave the protective cover on until the lamp is inserted. Avoid making fingermarks, or wipe off immediately.

- Remove the defect lamp.
- Put a new 12 V 100 W halogen lamp into the lamp holder without tilting (86.2 or 87.2).
- Move the collector back.
- Put on the lid and secure with screw (85.1 or 87.1).
- Align the lamphousing against the microscope and secure with the clamp screw.
- Connect the lamphousing to the power unit.

### Replacing the 12V 100W halogen lamp in lamphousing 106 z\*



**n. b.:**

Always disconnect external transformers and the microscope from the mains when carrying out assembly work!

- Switch off the microscope and the power unit.
- Disconnect the appliance cable of the microscope and the power unit.
- Slacken the clamp screw on the microscope and remove the lamphousing.
- Slacken the screws (88.4 and 88.9) on the lid with a cross-tip screwdriver.
- Pull the cut-out plug slightly out of the socket (88.11) and flip up lid.



**n. b.:**

Leave the protective cover on until the lamp is inserted. Avoid making fingermarks, or wipe off immediately.

- Slacken the fixing screws (88.10) on the lamp holder and pull out the lamp holder (Fig. 89).
- Remove the defect lamp.
- Put a new 12V/100W lamp into the lamp holder.
- Push in the lamp holder and secure it with the screws (88.10).
- Push the cut-out plug into the socket (88.11).
- Close the lid and tighten the screws (88.4 and 88.9) on the lid.
- Align the lamphousing against the microscope and secure with the clamp screw.
- Connect the lamphousing to the power unit.

## Changing the Hg and Xe lamps on lamphousing 106 z



n. b.:

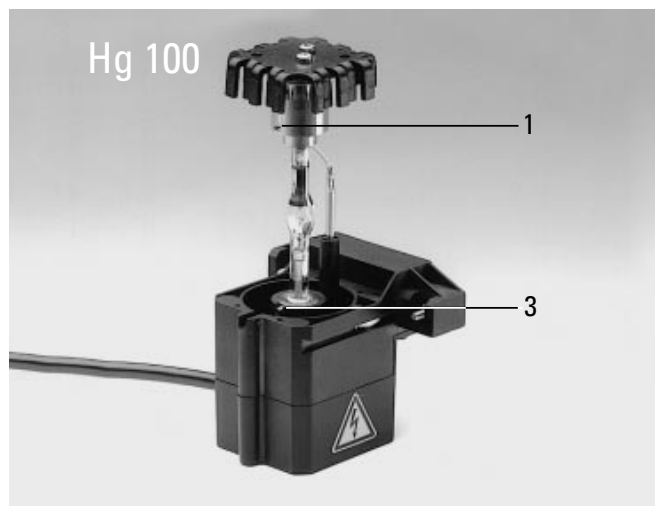
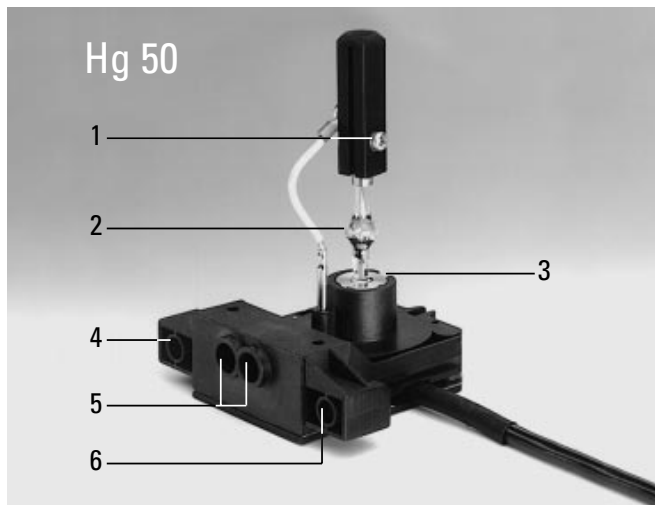
- Always disconnect the power unit from the mains before carrying out assembly work.
- Wait for the lamphousing to cool down for at least 15 minutes as otherwise it may explode.
- Never touch glass parts of the burner with your bare hands as finger perspiration burns in.
- Wipe off any finger perspiration and dirt carefully (perhaps using alcohol).
- Adjust the lamps immediately after ignition.
- Avoid switching on and off frequently, as this greatly reduces the life and stability of the lamp. Hot Hg lamps do not ignite again until they have cooled down. It is advisable to let new burners burn in for a few hours without interruption.
- Ensure that lamphousing is adequately ventilated. Never block the air vents with paper, etc. (fire risk).
- It is best to keep a record of the number of hours a lamp has been in use and compare it with the manufacturer's specifications.
- We cannot accept any liability for damage resulting from lamp explosions.

- Disconnect the power unit and the microscope from the mains.
- The LH 106 z L is opened by undoing the fixing screws (88.4), pulling the cut-out plug slightly out the socket (88.11) and flipping up the lid of the lamphousing.
- Slacken the safety screws (88.10) and pull out the lamp holder (Fig. 90).
- Insert the burner as follows, making absolutely sure to observe the safety measures described above:
- If there is a plastic cover on the burner, leave it on for the time being.
- Insert the burner so that 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).
- If the bulb has a glass seal point (90.2), the burner is turned so that this point will be **at the side**, not in the light path.
- Put the upper pin of the burner between the clamps of the flexible power supply and clamp with screw (90.1).
- Unscrew the stud (90.4) in the holder slightly, insert the lower end of the metal base and retighten the stud.
- Remove the protective covering from the burner now.

- Put the lamp holder with burner inserted into the lamphousing and secure with the screws (90.10).
- Close the lid of the lamphousing. When closing the lamphousing, make sure that the pins of the cut-out plug engage in the sockets.
- Retighten the screws of the lid.
- Push the cut-out plug in as far as it will go.
- Align the lamphousing against the microscope and secure with the clamp screw.
- Connect the lamphousing to the power unit (compare mains voltage!).

**Fig. 90** 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



# Storage

Protect your microscope from dust by putting on the cover after each work session.

The microscope must be kept in a cupboard in which the temperature is  $\geq 5^{\circ}\text{C}$  above room temperature. The cupboard must have ventilation holes which are plugged with cotton wool, for example, to keep dust out. If this type of storage is not possible, the microscope is kept in a closed container with drying agent (e. g. silicone balls).

# Packaging and transport

The original packaging should be used if the microscope has to be dispatched or transported. Also, the delivery note with full details should be enclosed.



# Technical description

All techniques, not only in microscopy, are subject to limits of performance due to basic physical laws and principles of eye physiology. The following information should therefore be remembered when using the microscope.

## Performance data of objectives

The Leica DM IRB microscope is based on tube length  $\infty$  (infinity) and a focal length of the tube lens of  $f = 200$  mm.

!

**n. b.:**

Therefore, only objectives with the  $\infty$  engraving and M 25 screw thread may be used.

The current objective range is constantly being updated. Please ask your Leica agency for a copy of the "Objective data sheets"!

## Objective lettering

Examples and explanation of symbols:

$\infty / -$   
C PLAN 10x/0.22

$\infty / 0.17$   
C PLAN 40x/0.65

$\infty$

Objective for tube length infinity ( $\infty$ ).

—

The objective can be used **with and without** a coverslip.

**0 – 2**

For use with coverslips with a thickness of 0 – 2 mm.

**0.1 – 1.3**

For use with coverslips with a thickness of 0.1 – 1.3 mm.

**0.17**

The objective may only be used with a coverslip of the standard thickness 0.17 mm. No coverslip or a coverslip with a very different thickness will greatly impair the image, particularly with high objective apertures (see below).

**0**

Use **without** a coverslip, e.g. for cell smears, incident light.

## **D (or A, B, C)**

Pupil position of objective (important, e.g. for IMC integrated modulation contrast).

### **Objective type (performance class):**

#### **C Plan**

Achromatic objective with particularly good price/performance ratio. Field performance max. 20 mm.

#### **N Plan**

Achromatic objective with increased field performance of at least 20 mm.

#### **PL FLUOTAR®**

Semiapochromats with particularly good field performance of at least 25 mm and chromatic correction. Universal optics for all techniques.

#### **PL APO**

Plan apochromats with a field performance of over 25 mm and maximum chromatic correction. The best objectives in the Leica range.

#### **HC**

**H**armonic **C**omponents.

#### **X**

Universally applicable, also backwards compatible with Delta optics (= predecessors of HC optics).

#### **L**

Long working distance.

## **10x/0.22**

**Magnification and aperture.** The aperture (pick-up angle) influences resolution, field depth, contrast and brightness. Objectives with built-in iris diaphragm have an engraving showing the maximum and minimum aperture, e.g. 0.85 – 0.55.



**n. b.:**

Objectives with built-in iris diaphragm.

The knurled ring may only be used for adjusting the diaphragm, not for screwing the objective in or out.

Risk of damage!

#### **OIL, W, IMM**

Immersion objectives for oil, water, universal (oil, glycerine, water, etc.).

#### **PH**

PH = phase contrast objective, with additional indication of assigned light ring in condenser, e.g. PH2.

#### **BD**

BD = brightfield/darkfield; objectives for incident light microscopy with M 32 screw thread.

#### **CORR**

Correction mount for continuous adjustment to coverslip/specimen slides or thickness of vessel base.

#### **P, POL**

Strain-free objective for quantitative polarisation microscopy.

#### **U-V-I**

With special achromatic correction, i.e. parfocal from the **u**ltraviolet through the **v**isual to the **i**nfared range (from 340 nm to 1000 nm).

## Colour coding of the objectives

The magnification of each objective is indicated as per DIN/ISO standard by a colour ring:

100x 125x 150x 160x	63x	40x 50x	25x 32x	16x 20x	10x	6.3x	4x 5x	2.5x	1.6x
white	dark blue	light blue	dark green	light green	yellow	orange	red	brown	grey

Immersion objectives also have a second colour ring underneath:

<b>Black</b>	Oil or IMM (= universal for oil, water, glycerine)
<b>White</b>	Water
<b>Orange</b>	Glycerine

The different colour of the objective engraving indicates the use of the objective:

<u>Black</u> or	Brightfield objectives,
<u>dark blue</u>	low-strain
<u>Green</u>	Phase contrast objectives, low-strain

## Locking of objectives







The front part of immersion objectives (OIL, W, IMM) can be pushed up (91.1 and 91.2) by about 2 mm and locked in a shortened position by a slight rotary movement. This stops any remaining drops of immersion liquid from wetting specimens or other objectives when the nosepiece is turned.

**Fig. 91** Immersion objectives


**1, 2** Oil immersion objectives (OIL), **1** in working position, **2** locked in shortened position, **3** Water immersion objective (W), **4** Universal immersion objective (IMM) for water, glycerine, oil, **5** Colour coding for immersion, **6** Knurled ring for screwing down



## Performance data of eyepieces

Leica eyepiece type	Magnification/fov	Eyepiece port +)	
HC PLAN	10x/20		M
HC PLAN	10x/20		
HC PLAN	12.5x/16		M
HC PLAN	10x/20		MF
HC PLAN	10x/22		M
HC PLAN	11x/20		MF

Eyepiece tube diameter: 30 mm

- +)
-  = With removable or push-back anti-glare protection for use with or without eyeglasses.
  - M = Adjustable eyelens (dioptre compensation) and slot for graticules of 26 mm diameter.
  - MF = With illuminated graticule.



The LEITZ PERIPLAN® eyepiece type may not be used! Earlier L PLAN type eyepieces may only be used with earlier type tubes (before about 1988) **without** the HC engraving!

### Eyepiece field of view

Each microscope configuration has a certain eyepiece field of view (see below), e.g. 20, which must not be exceeded. If the maximum fov is exceeded there may be disturbing loss of definition and/or vignetting at the edge of the image, → following pages!

The eyepiece field of view (fov) designates the diameter of the intermediate image in the eyepiece in mm, i.e. the diameter of the circular diaphragm that frames the image and that lies inside the eyepiece. This fov is specified on the eyepiece after the magnification, e. g. 10x/20.

For the Leica DM IRB microscope we recommend **fov 22**.



The maximum eyepiece field of view of a specific configuration is derived from the following microscope data:

- Field performance of the objectives**
- Field performance of the intermediate module(s)**
- Tube field number**
- Condenser properties**

The decisive value is always the **smallest**. For example, if the intermediate modules only permit a field of view of 20 mm, but the objectives and tube 25 mm, only eyepieces up to fov 20 can be used. Eyepieces with fov 25 can lead to vignetting in this case.

The diameter of the **viewable specimen area** is calculated by dividing the diameter of the field of view by the magnification of the objective and the magnification factor of the microscope optics.

Example:

Eyepiece 10x/20

Objective PLAN 4/0.10

Magnification factor of the Leica DM IRB

Microscope optics 1x

Viewable specimen area

$$\frac{20 \text{ mm}}{4 \times 1} = \varnothing 5 \text{ mm}$$

The **total magnification** of the microscope is worked out by multiplying the eyepiece magnification with the reproduction ratio of the objective and the magnification factor of the microscope optics.





Example:  
 Eyepiece 10x/20  
 Objective PLAN 4/0.10  
 Magnification factor 1x

Total magnification  $10 \times 4 \times 1 = 40x$

### Field performance of objectives

The field performance of objectives is not engraved on the objectives. It may vary within the same class, e.g. low objective magnifications may well exhibit slightly higher values than the average values given below:

Objective series	max. recommended eyepiece fov			
	15	20	22	25
Achromats	██████████			
C PLAN achromats	██████████			
APO L apochromats	██████████			
N PLAN planachromats	██████████			█
PL FLUOTAR® semiapochromats	██████████			
PL APO planapochromats	██████████			

**Fig. 92** Optical outfit  
 1 N PLAN objective series for brightfield, 2 HC PLAN 10x/20  and , HC PLAN 10x/22  and  M eyepieces



Your Leica agency can supply you with a constantly updated data sheet on all Leica objectives.

### 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. 506 950
- Graticule 10 mm/100 divisions with crosshair Order no. 506 952
- Graticule for standard series and Snyder-Graff method Order no. 566 950
- Graticule ASTM-E-112, grain size determination Order no. 566 951
- Graticule with 10 x10 x 0.1 mm grid divisions Order no. 506 954
- Graticule with 10 x10 x1 mm grid divisions Order no. 506 955

For calibrating the graticules, we recommend:  
 Incident light stage micrometer  
 1 mm = 100 divisions Order no. 563 011

**Fig. 93** Eyepiece 16x/14B  
 1 Clamp screw, 2 Spacer rings for Leica microscopes (must be pushed up as far as the stop)



## Filter performance data

Filter	Use
<b>Grey/neutral density filter N</b>	Grey (neutral density) filters are used for light attenuation without influencing the colour temperature. The engraved value, e.g. N16, indicates the attenuation value. So N16 means a reduction to $1/16 = 100/16 = 6.25\%$ transmission.
<b>Green filter, GR</b> , panchromatic	For general contrast enhancement and black-and-white photography.
<b>DLF</b>	Conversion filter ( <b>D</b> aylight filter, blue, similar to CB12), for colour photography with daylight film, integrated in filter magazine.
<b>BG38</b> (blue filter)	Suppresses red for fluorescence (integrated in fluorescence illuminator).
<b>ALF</b>	<b>A</b> rtificial light filter for enhancement of colour contrast in colour photography with artificial light films.
<b>BG20</b>	For highlighting red in Polaroid colour photography.
<b>VG9</b> (green filter)	Enhances contrast in chromosome photography.
<b>CB1.5, CB3</b>	Conversion filter, blue: raises colour temperature with special lamps.
<b>CR1.5</b>	Conversion filter, red: lowers colour temperature, e.g. from 6000 K (colour temperature of an Xe lamp) to 5500 K (colour temperature of daylight film).
<b>BG23</b>	Enhances contrast of the complementary colours blue and red for black-and-white film.

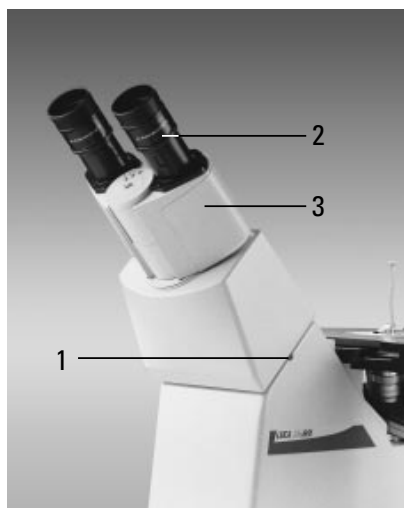
## Tube performance data

Tube changing is the same as for the upright microscopes.

The tubes are interchangeable.

**Fig. 94** HCI B22, 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

1 Clamp screw, 2 Tube port, 3 Siedentopf binocular part



## Binocular tube HCI B22

The binocular tube consists of a basic part with the tube change ring at the bottom. The tube lens has the factor 1x. The Siedentopf binocular part allows adjustment of the interpupillary distance from 55 mm to 75 mm. The viewing angle is 45°. The tube has adjustable eyepiece tubes for mechanical compensation of the tube length when the interpupillary distance changes. It allows a field of view index of 22.

## Binocular ergotube HCI BV22

Like HCI B22, but with variable viewing angle of 15° – 30°.

**Fig. 95** HCI 3T22, Trinocular tube, 45° viewing angle,

Light path: 100 % vis – switch rod 

50 % – 50 % – switch rod 

100 % – photo – switch rod 

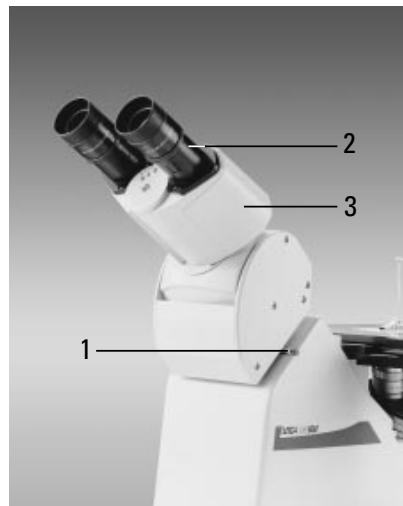
Field of view index up to 22, eyepiece diameter 30 mm for HC PLAN 10x/20 or 22 eyepieces, interpupillary distance setting: 55 – 75 mm

1 Clamp screw, 2 Tube port, 3 Siedentopf binocular part, 4 Photo/TV exit, 5 Switch rod



**Fig. 96** HCI BV22, 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

1 Clamp screw, 2 Tube port, 3 Siedentopf binocular part



## Trinocular tube HCI 3T22

The trinocular tube consists of a basic part with the tube change ring at the bottom, the tube lens has the factor 1x. The Siedentopf binocular part allows adjustment of the interpupillary distance from 55 mm to 75 mm. The viewing angle is 45°. The tube has adjustable eyepiece tubes for mechanical compensation of the tube length when the interpupillary distance changes. It allows a field of view index of 22. The documentation port is only operated with HC components.

The tube contains a switchable mirror with three settings:

100 %	visual
50 % / 50 %	visual/photo
100 %	photo

## Tube adapter R/IR

The tube adapter R/IR enables compatibility of all tubes with viewing angle 30° of the Leica DM R range.




On the Leica DM IRB/E these tubes are only suitable up to 22 fov.

## HC FSA 25 PR

Binocular observation and photo tube, viewing angle 30°, with back reflection.

Controllable dark flap of the binocular port for photography and microphotometry.

3 clickstop positions of the beamsplitter in the tube:

Switch rod		Observation	Photo
VIS		100 %	0 %
50/50		50 %	50 %
PHOTO		0 %	100 %

Back reflection only at the 50 % / 50 % beamsplitter position.



## HC FSA 25 PE

Binocular observation and photo tube, viewing angle 30°, with provision for optical overlay for documentation of transparencies (slide overlay device) or opaque macro objects (macro device).

3 clickstop positions of the beamsplitter in the tube:

Switch rod		Observation	Photo
VIS		100 %	0 %
50/50		50 %	50 %
PHOTO		0 %	100 %

## Condenser performance data

### Condenser 0.30 S70

Without height adjustment, as the fixed focus concept of this condenser guarantees optimal matching of light and phase rings for liquid levels up to 60 mm. FWD (free working distance) 70 mm. For brightfield (HF), phase contrast (PH, Phaco), transmitted light interference contrast (ICT) and polarisation contrast up to 40x objective magnification in each case.

### Condensers 0.53 S23 and 0.90 S1

The condenser has a slide changer, height adjustment and centration facility for setting Koehler illumination. The holder holds the base part of the condenser, which can be fitted with condenser tops 0.53 S23, 0.90 S1 or P 1.40 OIL S1 to suit the particular application.

### Possible applications of the condensers for the Leica DM IRB

Illumination technique	Condenser 0.30 S70 objective	Diaphragms/accessories	Condenser 0.53 S23 objective	Diaphragms/accessories	Condenser 0.90 S1 objective	Diaphragms/accessories
Brightfield	2.5x – 40x	–	5x – 100x	–	10x – 100x ●	–
Phaco	5x 10x, 20x 40x –	PH 0 S70 PH 1 S70 PH 2 S70 –	5x 10x, 20x 40x, 63x 100x	PH 0 S23 PH 1 S23 PH 2 S23 PH 3 S23	– 10x, 20x 40x, 63x 100x	– PH 1 S1 PH 2 S2 PH 3 S3
Interference contrast	10x – 40x	ICT device	10x – 100x	ICT device	10x – 100x ⊗	ICT device
Pol contrast	2.5x – 40x	Pol device	5x – 100x	Pol device	10x – 100x ●	Pol device
Darkfield	–	–	5x – n. a. 0.40	3 S23 △	10x – n. a. 0.75	D S1

⊗ 100 x for maximum resolution also possible with condenser top P 1.40 OIL S1

△ Light ring 3 S23 serves as DF diaphragm

● For maximum resolution there is also a condenser top P 1.40 OIL S1

Together with condenser top 0.53 S23, max. FWD 30 mm, culture vessels can be examined microscopically up to liquid levels of 25 mm. For contrasting techniques brightfield (HF), phase contrast (Phaco/PH), transmitted light interference contrast (ICT) and polarisation contrast, objectives with magnifications up to 100x can be used. For transmitted light darkfield we recommend objectives with a numerical aperture up to 0.40.

For condenser top 0.90 S1, max. FWD 1 mm, thin specimen slides and coverslips must be used as substrates for the specimen. Objectives with a numerical aperture up to 0.75 are suitable for transmitted light darkfield. All other contrasting techniques can be performed up to objective magnification 100x.

### **Condenser disc**

All condensers of the Leica DMIRB are equipped with a 6-position disc which can be fitted with an individual choice of annular stops for phase contrast (PH), darkfield (DF) or IC prisms for transmitted light interference contrast (ICT).

## **Performance data of stages and mountable object guides**

### **Plane stage**

With hole for insert rings of 20 mm diameter or 40 mm diameter. Holes for inserting specimen clips and two threaded holes on left and right underneath the stage for attachment of the object guide.

### **Object guide**

Adjustment range: X 127 mm x Y 83 mm

To accommodate holders for different culture vessels. Self-adhesive scales for the holders are enclosed for coordinate adjustment reading. These should be stuck in the countersinks of the object guide.

### **3-plate x/y stage**

Adjustment range: X 60 mm x Y 40 mm

With hole for insert rings of 20 mm diameter or 40 mm diameter. Holes for inserting specimen clips. Coaxial drive for specimen positioning with universal joint.

### **Rotary stage with object guide and frame insert for coverslips**

Rotation radius: 360°

Adjustment range of the object guide:

X 40 mm x Y 40 mm

The object guide accommodates specimen slides or the frame insert for coverslips. The minimum size of coverslips that can be secured in the frame insert is 22 mm x 32 mm.

## Stages

### Plane stage and mountable object guide

The plane stage is secured to the microscope with 3 screws. The object guide can be mounted to either the right or the left of the plane stage.

#### 3-plate x/y stage

To attach the stage, 3 screw holes first have to be accessed by moving the stage in x/y direction.

#### Rotary stage and frame insert for coverslips

The rotary stage is secured with 3 screws. Move the rotary mount to gain access to all the screw holes. Put the screws in the holes.

n.b. Use washers as well for the holes at the back. Only screw the screws in lightly, as the rotary stage first has to be centred: to do this, insert the centring aid in the rotary stage. Engage the Bertrand lens by turning the knurl and focus with the lever. Move the stage until the bright circle is in the centre of the field of view. Then fix the stage in position, disengage the Bertrand lens and remove the centring aid. To secure specimen slides in frame inserts, press the middle of the leaf spring and slide in the coverslip in the direction of the arrow. Clamp the frame insert in the object guide.

### Performance data of the incident light fluorescence illumination\*

The Leica DMIRB microscope is preferably equipped with mercury or xenon gas discharge lamps for fluorescence applications as they offer higher intensity. However, a 12 V 100 W halogen lamp can be used as well.

## Lamphousing performance data

### Lamphousing 106\*

Lamphousing 106 is equipped with a 12 V 100 W halogen lamp. The lamp holder is centrable in x and y direction. The aspherical collector can be focused. Lamphousing 106 is fitted with a diffusing disc and heat protection filter, but does not have a reflector.

### Lamphousing 106 z\*

Like lamphousing 106, but additionally with centrable and focusable reflector and 4- to 6-lens collector. A quartz collector is available on request. The following lamps can be used (each have their own holder):

- 12 V/100 W halogen lamp (A.C.)
- Ultra high pressure 50 W Hg lamp (A.C.)
- Ultra high pressure 100 W Hg lamp (D.C. stabilised/non-stabilised)
- Ultra high pressure 100 W Hg lamp (D.C. stabilised/non-stabilised, type 103 W/2)
- High pressure 75 W xenon lamp (D.C. stabilised/non-stabilised).

### Lamphousing 107/2

The shield connection of the lamphousing is screwed to the potential equalisation point of the 12 V 100 W power unit. This lamphousing for transmitted and incident light has a fixed 1-lens collector and a fixed 12 V 100 W lamp.

!

n. b.

Lamphousings LH 105 have been replaced by lamphousings LH 106. However, they are compatible with LH 106 lamphousings and can also be used.

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

Lamphousings with order nos.

Non-centrable lamphousings

	LH 106	LH 107, left	LH 107/2	LH 35/2
6 V/35 W 12 V/100 W, 0.55 m 12 V/100 W, 2.0 m 12 V/100 W, 2.0 m, shielded	504 058 504 059	504086	504 080  504 085	504088

Centrable lamphousings

	LH 106, right-hand op.		LH 106, left-hand op.
	4-lens	6-lens	6-lens
12 V/100 W, 0.55 m 12 V/100 W, 2 m 12 V/100 W, 2.9 m	507 070 504 071	504 065	504 087
Hg 100 W, with ZG Hg 100 W, with ZG, 3 m Hg 100 W, without ZG Hg 50 W Xe 75 W	504 068 504 069 504 083	504 062 504 063  504 061	504 090 504 066 504 089

# General technical data

## General technical data

For indoor use only

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

## Technical data of the power unit

### General technical data

For indoor use only

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

### Technical specifications

Lamp voltage:	Adjustable from 2.5 V ± 5 % to 12 V – 5 % / 8.5 A
Voltage setting:	Potentiometer 5 KOhm Rotated clockwise for maximum intensity
Maximum lamp voltage:	12.0 V in the range 90 V to 250 V~
Soft start:	Rise time up to maximum output voltage 0.2 to 1 second
Mains voltage dependence	
$U_N$ = mains voltage	
$U_{La}$ = lamp voltage	
$U_N$ : 90 – 250 Vac, $U_{La}$ = 12 V:	< – 5 %
$U_N$ : 90 – 250 Vac, $U_{La}$ < = 11 V:	< ± 1 %
$U_N$ : 100 – 130 Vac, $U_{La}$ < = 11 V:	< ± 0.5 %
$U_N$ : 200 – 250 Vac, $U_{La}$ < = 11 V:	< ± 0.5 %
Lamp voltage drift 0 to 10 min.:	< 2 %
Efficiency:	approx. 75 %
Short-circuit and open-circuit proof	
Life span:	> 50,000 hours

# Main wearing and spare parts, tools

Order No. Part no.	Component	Used for
<u>Spare lamps</u>		
500 974	Halogen lamp 12 V 100 W	Lamphousing 105
500 137	Ultra high pressure Hg lamp 50 W	Lamphousing 106 z
500 138	Ultra high pressure Hg lamp 100 W	Lamphousing 106 z
in preparation	Ultra high pressure Hg lamp 100 W (103 W/2)	Lamphousing 106 z
500 139	High pressure xenon lamp 75 W	Lamphousing 106 z
<u>Tools, adjustment keys</u>		
016-500.020-001	Hexagonal screwdriver	Assembly and adjustment
020-434-045	2.5 mm Allen key, angled, short	Assembly of heating stage and illumination mirror
<u>Screw cover for unoccupied nosepiece positions</u>		
020-422.570-000	Screw cover M25	Objective nosepiece
<u>Spare eyecups (glare protection) for HC PLAN eyepiece</u>		
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
<u>Immersion oil, DIN/ISO standard, fluorescence-free</u>		
513 787	10 ml	OIL and IMM objectives and oil condenser tops
513 522	100 ml	
513 788	500 ml	
<u>Spare fuses, IEC 127-2 and/or UL 198 G standard and/or company type:</u>		
846-205.000-00	T 4 A Wickmann 19 195/ Schutter FST	Leica 12 V 100 W

# 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 IRB**

**Instrument type:** **Light microscope**

**Instrument no.:** 020-525.701 to  
020-525.780

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

**Harmonised  
standards  
applied:** EN 50081-1  
EN 50082-1  
EN 61010-1

Wetzlar, 18. 4. 1997

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





Leica Microsystems Wetzlar GmbH  
Ernst-Leitz-Straße  
D-35578 Wetzlar (Germany)

Tel. +49 (0) 64 41-29 0  
Fax +49 (0) 64 41-29 25 99  
www.leica.com

The Leica logo is written in a red, cursive script font with a thin underline.

© Leica Microsystems Wetzlar GmbH · Ernst-Leitz-Straße · 35578 Wetzlar · Tel. (0 64 41) 29-0 · Fax (0 64 41) 29-25 99 · Printed on chlorine-free bleached paper.  
Order nos. of the editions in: **English 933 809** · German 933 809 · French 933 809 · Part-No. 521-190 · Printed in Germany · XI/98/AW/FD.M.H.