

Instruction Manual

## **ZEISS Axiovert 5, Axiovert 5/7 materials**

Inverted Microscope for Research and Routine Microscopy



## ZEISS Axiovert 5, Axiovert 5/7 materials

### Original Manual

<b>EC</b>	<b>REP</b>
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# 1 About this Instruction Manual

This Instruction Manual (further called "document") is considered to be part of the Axiovert 5/7, herein after referred to as "microscope".

This document contains basic steps and safety information that must be observed during operation and maintenance. Therefore, the document must be read by the operator prior to commissioning and must always be available at the place of use of the microscope.

This document is an essential part of the microscope and, if the microscope is resold, the document must remain with the microscope or be handed over to the new owner.

## 1.1 Text Conventions and Link Types

Explanation	Example
Software controls and GUI elements.	Click <b>Start</b> .
Hardware controls and elements.	Press the <b>Standby</b> button.
Key on the keyboard.	Press <b>Enter</b> on the keyboard.
Press several keys on the keyboard simultaneously.	Press <b>Ctrl + Alt + Del</b> .
Follow a path in the software.	Select <b>Tools &gt; Goto Control Panel &gt; Airlock</b> .
Text to be entered by the user.	Enter <i>example.pdf</i> in this field.
Anything typed in literally during programming, for example macro codes and keywords.	Enter <code>Integer</code> in the console.
Link to further information within this document.	See: <i>Text Conventions and Link Types</i> [▶ 7].
Link to a website.	<a href="https://www.zeiss.com/corporate/int/home.html">https://www.zeiss.com/corporate/int/home.html</a>

## 1.2 Explanation of Warning Messages and Additional Information

DANGER, WARNING, CAUTION, and NOTICE are standard signal words used to determine the levels of hazards and risks of personal injury and property damage. Not only the safety and warning messages in the **Safety** chapter are to be considered also all safety and warning messages in other chapters. Failure to comply with these instructions and warnings can result in both personal injury and property damage and involve the loss of any claims for damages.

The following warning messages indicating dangerous situations and hazards are used in this document.

### **DANGER**

#### **Type and source of danger**

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

**⚠ WARNING**

**Type and source of danger**

WARNING indicates a potentially hazardous situation which, if not avoided, may result in death or serious injury.

**⚠ CAUTION**

**Type and source of danger**

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

**NOTICE**

**Type and source of danger**

NOTICE indicates a potentially harmful situation which, if not avoided, may result in property damage.

**Info**

Provides additional information or explanations to help the operator better understand the contents of this document.

**1.3 Explanation of Symbols**



CE marking (Conformité Européene)



CSA label: product tested by CSA to meet U.S. and Canadian standards. CSA approval master number optionally given adjacent to this symbol



UKCA marking (UK conformity assessed)



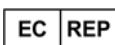
Manufacturer



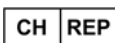
Country of manufacture. "CC" is the country code, e.g. "DE" for Germany, "CN" for China. Date of manufacture optionally given adjacent to this symbol



Importer









Authorized representative in the European Community



Swiss authorized representative



	In-vitro diagnostic medical device
	Serial number
	Catalogue number
	WEEE label: Do not discard as unsorted waste. Send to separate collection facilities for recovery and recycling
	The service life of electronic and electrical product environmental protection is 50 years during the use.
	KC mark accompanied with KC code

## 1.4 Further Applicable Documents

Please take also note of the following documents:

<b>Brochures and Certificates</b>	For brochures, certificates (e.g. ISO, CSA, SEMI), and declarations of conformity (e.g. EU, UK) ask your ZEISS Sales & Service Partner.
<b>Local and National Health and Safety Regulations</b>	Observe local and national health and safety regulations for the location of installation and during the use of the microscope. Consult with your ZEISS Sales & Service Partner if these regulations are in conflict with the installation requirements of the microscope.
<b>Safety Data Sheets</b>	Observe the enclosed safety data sheets. The instructions and guidelines given in the respective safety data sheets must be complied with.
<b>Software</b>	For detailed information on how to use the OSD, Labscope or ZEN, please refer to their Online Help or ask your ZEISS Sales & Service Partner.
<b>System and third-party Components, Accessories</b>	Information about the individual components, enhancements, and accessories can be obtained from your ZEISS Sales & Service Partner. Also refer to the documentation of third-party manufacturers.
<b>Instruction Manuals</b>	For detailed information refer to the following Instruction Manuals of: <ul style="list-style-type: none"> <li>▪ Light sources (e.g. HBO 50, HXP 120 V, Colibri, X-Cite Xylis®)</li> <li>▪ Scanning stage</li> <li>▪ Heating stage S1</li> <li>▪ Quick guide Cleaning the Microscope</li> </ul>

## 1.5 Contact

If you have any questions or problems, contact your local ZEISS Sales & Service Partner or one of the following addresses:

### Headquarters

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Fax: +49 3641 64 3439

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Email: [info.microscopy.de@zeiss.com](mailto:info.microscopy.de@zeiss.com)

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### Microscopy Courses, Training, and Education

For information on microscopy courses, training, and education contact us on our homepage (<https://www.zeiss.com/microscopy/int/service-support/training-and-education.html#contact>).

### ZEISS Portal

The ZEISS Portal (<https://portal.zeiss.com/>) offers various services that simplify the daily work with your ZEISS systems (machines and software). It is constantly improved and extended to meet your needs and requirements better.

### ZEISS Sales & Service Partner

You can find a ZEISS Sales & Service Partner in your area under <https://www.zeiss.com/microscopy/int/website/forms/sales-and-service-contacts.html>.

### Service Germany

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## 2 Safety

This chapter contains general requirements for safe working practices. Any person using the microscope or commissioned with installation or maintenance must read and observe these general safety instructions. Knowledge of basic safety instructions and requirements is a precondition for safe and fault-free operation. Operational safety of the supplied microscope is only ensured if it is operated according to its intended use.

If any work is associated with residual risks, this is mentioned in the relevant parts of this document in a specific note. When components must be handled with special caution, they are marked with a warning label. These warnings must always be observed.

Any serious incident that has occurred in relation to the microscope and its components shall be reported to these institutions:

- the competent authority of the Member State in which the user is established
- ZEISS
  - for users within the EU:  
Carl Zeiss Microscopy GmbH, Jena, Germany
  - for users outside the EU:  
Carl Zeiss Suzhou Co., Ltd., Suzhou, China

### 2.1 Intended Use

Improper use of the microscope and its components can easily lead to impairment of their function or even damage them. Damage caused by incorrect operation, negligence, or unauthorized intervention, in particular by removing, modifying, or replacing parts of the microscope or its components, cannot be held liable by the device manufacturer. Third-party devices or components that are not expressly approved by ZEISS may not be used.

#### 2.1.1 Intended Purpose

The inverted microscopes Axiovert 5 are instruments for general microscopic imaging for the in-vitro examination of various biological samples including samples collected from humans or animals. This imaging provides information to further assess physiological and pathological conditions. The microscopes are intended to be used by trained professionals only.

Axiovert 5 microscopes include:

- Axiovert 5 TL
- Axiovert 5 TL SCB
- Axiovert 5 TL FL SCB

The inverted microscopes Axiovert 5/7 materials are designed as universally usable microscopes for applications such as materials analysis in research and industry. It is not intended to either directly or indirectly generate medical diagnostic results.

Axiovert 5/7 materials microscopes include:

- Axiovert 5 RL SCB
- Axiovert 5 RL TL SCB
- Axiovert 7 RL
- Axiovert 7 RL TL

Thanks to its virtually unrestricted sample space, this stand permits an unlimited use of conventional samples. In other words, it facilitates the examination of large samples, workpieces, etc.

### 2.1.2 Optical Risk Grouping

According to EN 62471 sources of optical radiation are classified into risk groups subject to their potential photobiological hazard. Sources are classified into the following four groups according to hazard, based on the emission limit as well as permissible exposure time before hazard exceeded.

Risk group	Description
Exempt	No photobiological hazard.
1	No hazard due to normal behavioural limitations on exposure.
2	No hazard due to the aversion response to very bright light sources or thermal discomfort.
3	Hazardous even for momentary exposure.

**Detachable Light Sources** The microscope can be equipped with different detachable reflected or fluorescence light sources. The optical radiation risk group according to IEC 62471 for those detachable light source ranges from risk group 2 to risk group 3. They will all degrade to risk group 0 or risk group 1 while integration into the system. Optical radiation may cause damage to the skin and eyes.

- Make sure the microscope is switched off while assembling/disassembling the light sources.
- Avoid exposure of eyes and skin to radiation.

The following table lists the risk grouping of the available light sources/illumination units according to the mentioned standard:

Light source/Illumination unit	Risk group
Axiovert 5/7 stand (illuminator TL LED 10 W integrated)	2 (moderate risk)
Illuminator RL LED 10 W	2 (moderate risk)
HAL 100	2 (moderate risk)
HXP 120	2 (moderate risk)
HBO 50	3 (high risk)
Colibri 3	3 (high risk)
X-Cite Xylis	3 (high risk)

### 2.1.3 Lifetime

A microscope is an opto-electronic device. Its availability for use is significantly determined by the performed maintenance. ZEISS guarantees the ability for maintenance and repair within eight years after initial operation. This is ensured by a corresponding service and spare parts concept, thus enabling the intended purpose within this duration.

### 2.1.4 EMC Information

Use of this instrument in a dry environment, especially if synthetic materials are present (synthetic clothing, carpets etc.) may cause damaging electrostatic discharges that may cause erroneous result.

The EMC performance has been verified as Class 1B for EMI and basic electromagnetic environment for EMS under the standardized configurations. There might be a degradation while an external component/accessory incorporated.

The microscope is likely to perform incorrectly if used in a home healthcare environment. If it is suspected that performance is affected by electromagnetic interference, correct operation may be restored by increasing the distance between the microscope and the source of the interference. The electromagnetic environment should be evaluated prior to operation of the microscope.

Do not use the microscope in proximity to sources of strong electromagnetic radiation (e.g. unshielded intentional RF sources), as these can interfere with proper operation. Any Electrostatic discharge might cause an interruption of the HDMI output, if connected, but it can always be self-restored after several seconds.

The following EMC user notice is for Korea only:

기종별	사용자안내문
A급기기(업무용방송통신기자재)	이기기는업무용(A급) 전자파적합기기로서 판매자또는사용자는이점을주의하시기바라며, 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

## 2.2 General Safety Information

This document must be read before commissioning in order to ensure safe and uninterrupted operation. Pay particular attention to all listed safety notes. Make sure, that

- the operating personnel has read and understood this manual, associated documents and particularly all safety regulations and instructions, and applies them.
- the local and national safety and accident prevention regulations must be observed, as well as the applicable laws and regulations in your country.
- this document is always available at the place of use of the microscope.
- the microscope is always in perfect condition.
- the microscope is secured against access by unauthorized persons.
- maintenance and repair work, retrofitting, removal or replacement of components, as well as any other intervention in the microscope not described in this document, may only be carried out by the manufacturer ZEISS or persons expressly authorized by ZEISS to do so.

### 2.2.1 Requirements for Operators

The microscope, components, and accessories may only be operated and maintained by authorized and trained personnel. The microscope may only be used in accordance with this document. If the microscope is not used as described, the safety of the user may be impaired and/or the microscope may be damaged.

Any unauthorized intervention or use other than within the scope of the intended use shall void all rights to warranty claims. The regional regulations on health protection and accident prevention must be observed at all times and during all work on and with the microscope.

### 2.2.2 Safe Operating Condition

If circumstances occur which impair safety and cause changes in operating behavior, the microscope must be shut down immediately and a ZEISS service representative should be informed.

The microscope may only be operated after correct installation by a ZEISS service representative and if the operating conditions are adhered to.

- Do not operate the microscope until you have completely read and understood the entire documentation.
- Make sure that all protective cover panels are installed and all warning labels are available and legible.
- Ensure conditions and take measures to prevent the build up of electrostatic charge on the workplace.

## 2.3 Prevention of Hazards

This section summarizes potential hazards and recommended safety precautions. Failure to follow the safety instructions and instructions may result in personal injury and property damage.

### 2.3.1 Mechanical Hazards

**Crushing Hazards due to Motorized Components** The microscope contains motorized components. Fingers could be trapped. Do not reach into the working area of motorized components when they are in operation.

**Crushing Hazards due to Unstable Working Table** The toppling and falling of the microscope may cause injuries to the user. Only operate the microscope on a stable working table with a solid and smooth tabletop.

**Property Damage due to Transport** There is a risk of injury and property damage if the microscope is improperly handled and transported.

- Only use the handle, if applicable, for transport of the microscope. Otherwise hold the microscope with one hand and the base plate with the other hand.

### 2.3.2 Electrical Hazards

**Voltage Hazards** Risk of electric shock in case of contact with live parts.

The microscope must be plugged into a properly installed power socket with protective earth contact using the supplied mains cable. The protective earth connection must not be impaired by the use of extension cables.

Safe disconnection from the power supply is only ensured by pulling out the mains plug. The switch on the microscope only switches to standby mode.

Detachable mains supply cords must not be replaced with inadequately rated cords. Always use the power cords supplied by ZEISS. When an unsuitable power cord is used, ZEISS can no longer guarantee the electrical safety and functionality of the microscope.

- Shut down the microscope when not using the microscope.
- Disconnect the power supply before cleaning.
- Set up and operate the microscope so that the connectors are easily accessible.
- Position the microscope in a way so that you can easily unplug the power cable at any time.

### 2.3.3 Thermal Hazards

**Heat Accumulation** Covering the ventilation openings can lead to heat accumulation that may damage the microscope and, in extreme cases, can cause a fire.

- Keep ventilation openings unobstructed at all times.
- Do not cover devices or openings emitting heat.
- Do not obstruct ventilation.
- Comply with minimum distance of 30 mm from walls.

### 2.3.4 Hazards Generated by Radiation

**Optical Radiation Hazards** Gas discharge lights, LED lights and other sources of white light emit strong optical radiation (e.g. UV, VIS, IR). Optical radiation may cause damage to the skin and eyes. The extent of the damage depends on the parameters such as wavelength, exposure time, mode of operation (continuous or pulsed), etc.

- Avoid exposure of eyes and skin to radiation.
- Do not introduce reflective objects into the beam path.
- Never remove covers or cover panels during operation.

- Do not disable any interlock system elements.
- Use suitable protective equipment / protective clothing if required.

**Strong Light Hazard** When using an external light source, refer to its own manual. There is a risk of dazzling and blindness.

- Never look directly into the fibre optic output of a cold light source.

### 2.3.5 Hazards Generated by Materials and Substances

- Biological Hazard** Biological substances/agents may pose a risk to the health of humans and other living organisms.
- Keep a logbook of the known biological substances/agents used when working with the microscope and show it to the ZEISS service representative before they perform any work on the microscope.
- Hazard of Skin Irritation** The immersion fluid can cause skin irritation.
- Avoid any contact with skin, eyes and clothes.
  - Read and observe the safety data sheet of the immersion fluid.
  - In the event of skin contact, wash the oil off with plenty of water and soap.
  - In the event of eye contact, flush eyes with copious amounts of water for a minimum of 5 minutes. See a medical specialist if the irritation persists.
- Disinfectant Hazards** Ensure adequate ventilation in closed rooms. In case of insufficient ventilation, wear respiratory protective equipment. Remove any harmful residue. Allow the device to dry off after disinfection, particularly after disinfection of eyepieces. Do not inhale vapors. When using disinfectants, do not eat, drink or smoke. Avoid contact with eyes and skin. Remove contaminated clothing and wash before reuse.
- Infection Hazards** Direct contact with the eyepieces can be a potential way of passing on bacterial and viral infections.
- The risk can be lowered by using personal eyepieces or eyecups. If eyepieces need to be disinfected frequently, ZEISS recommends to use the eyepieces without eyecups.
  - To avoid infections, the use of personal protective equipment (PPE), e.g. gloves, for operation, cleaning, and decontamination is highly recommended. Disposable gloves can be decontaminated with alcohol for example, if necessary, or should be changed frequently to minimize the risk of contamination.
- Consumable Hazards** Incorrect handling of consumables and cleaning agents can lead to property damage or skin and eye injuries. Consumables that are not approved by ZEISS can lead to property damage. Consult your ZEISS Sales & Service Partner to learn what consumables you can order and how to handle them.
- Hazardous Substances** The microscope and other components can come into contact with various specimens and substances that can be hazardous to humans and the environment. The microscope is not equipped with special equipment protecting it from corrosive, potentially infectious, toxic and radioactive or other samples that may be hazardous to health.
- Make sure that the microscope was not in contact with hazardous substances (check the laboratory logbook); otherwise, the microscope must be cleaned/decontaminated/disinfected.
  - Check the components also. If necessary, clean the components as meticulously as possible. Label contaminated/infected components that cannot be properly cleaned.
  - Contaminated parts shall not be returned to any ZEISS department. Decontaminated parts can be sent to ZEISS accompanied by a signed „Customer Declaration of Decontamination“.
  - Wear gloves.
  - Observe all legal requirements, in particular the relevant national accident prevention regulations.

### 2.3.6 Hazards Generated with the Operating Environment

**Dirt, Dust, and Moisture**

Dirt, dust, and moisture can impair the microscope’s functionality.

- Shut down the microscope whenever it is not used and cover it with a dust protection cover.
- Always cover unused openings/ports.
- Perform regular maintenance and cleaning according to the instructions in this manual.
- Make sure that no cleaning liquid or moisture gets inside the microscope.
- Make sure that the electrical parts never come into contact with moisture.
- Never expose the microscope to inadmissible climate conditions (high humidity and temperature).

**Explosive Atmosphere**

Fire hazard due to explosive or flammable environment.

Do not operate the devices included in the scope of delivery in a potentially explosive atmosphere, in the presence of volatile anesthetics or flammable solvents such as alcohol, petrol or similar substances.

## 2.4 Labels and Lights

This chapter shows labels and, where applicable, indicator lights.

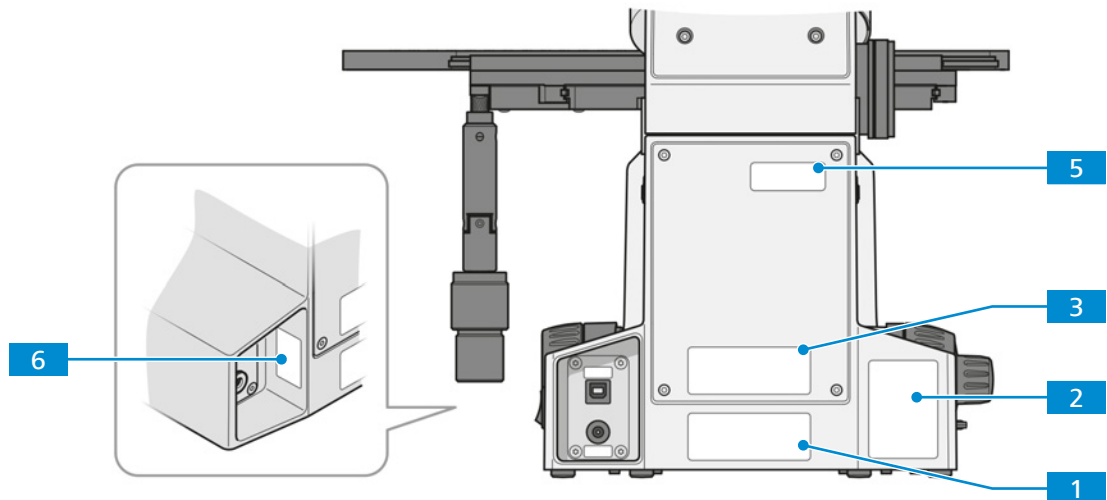
All parts that may pose specific hazards are marked with warning labels.

Always observe **all** warning labels!

- Check all warning labels for availability and legibility.
- Immediately replace damaged or illegible warning labels.

In case a label is missing please contact your ZEISS service representative for free of charge replacement.

### 2.4.1 Labels on the Microscope





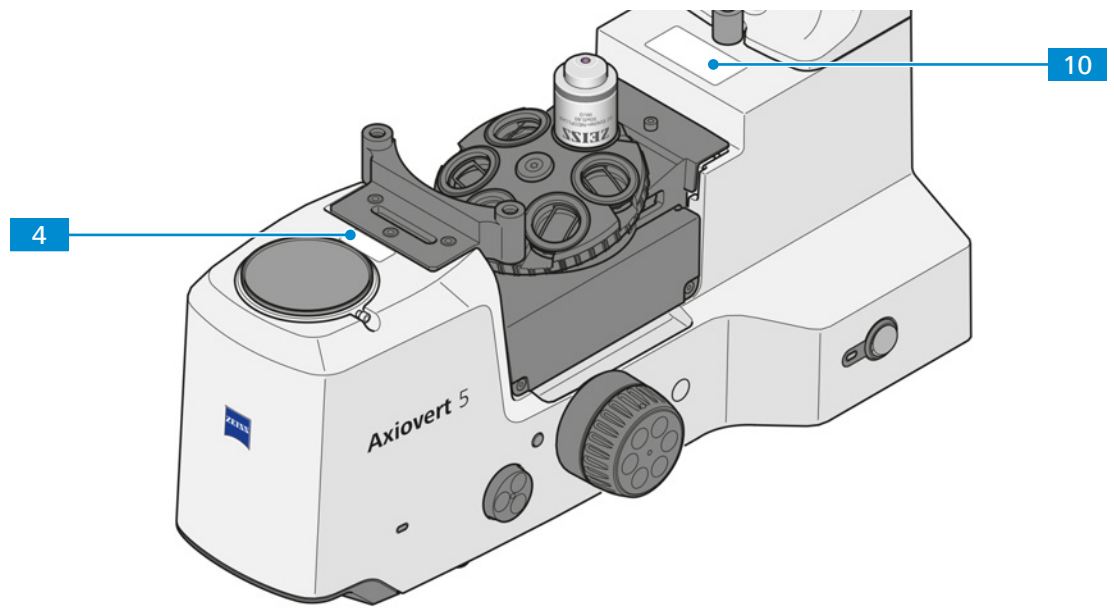

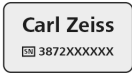

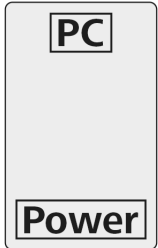
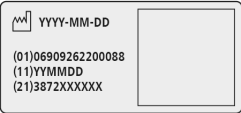




Fig. 1: Position of information labels on the microscopes

Pos.	Symbol	Description
1		Microscope type label
2		Microscope type label not applicable for Axiovert 5/7 materials microscopes
		Microscope type label only applicable for Axiovert 5/7 materials microscopes

Pos.	Symbol	Description
3		Axiovert 5, Axiovert 5/7 materials EU Representative Carl Zeiss Microscopy GmbH Carl-Zeiss-Promenade 10 07745 Jena, Germany
4		Serial number label
5		Patent label
6		Socket label: PC/Power
10		UDI label not applicable for Axiovert 5/7 materials microscopes
*		EU representative and importer label * Label is placed on the microscope packaging.
*		Swiss representative and importer label * Label is placed on the microscope packaging.

2.4.2 Labels on the Carrier for Transmitted-light Illumination

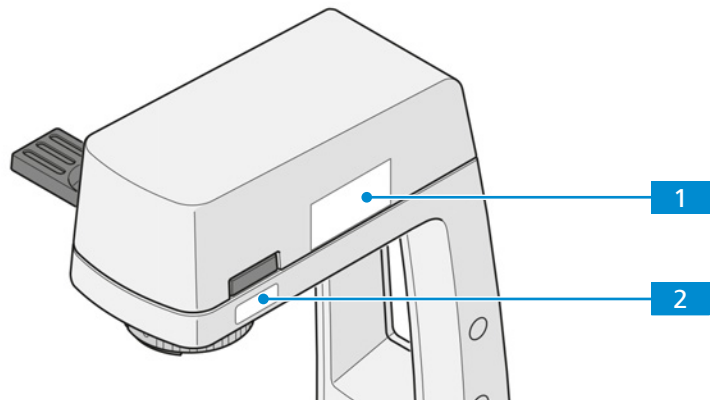


Fig. 2: Position of warning labels on the carrier for transmitted light illumination

Pos.	Symbol	Description
1		<p>Risk Group 2 according to IEC 62471</p> <p>NOTICE: UV emitted from this product. Minimize exposure to eyes or skin. Use appropriate shielding.</p> <p>CAUTION: Possibly hazardous optical radiation emitted from this product. Do not stare at operating lamp. May be harmful to the eyes.</p>
2		<p>LED aperture</p>

2.4.3 Information Labels on Microscopes with Integrated Smart Control Box

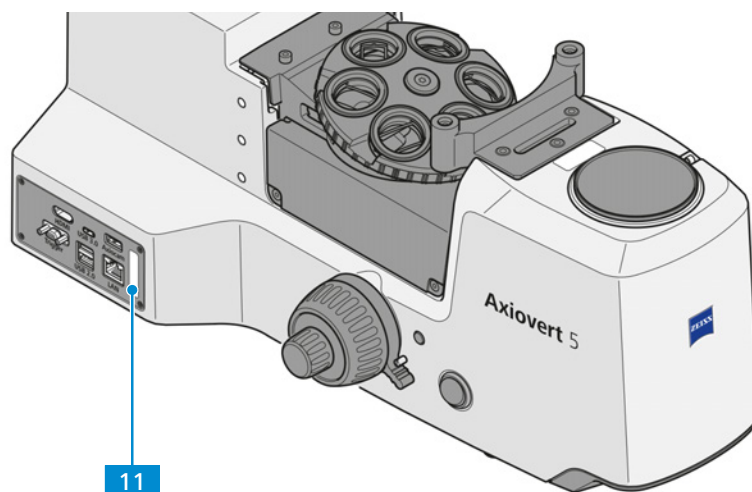


Fig. 3: Position of information labels on microscopes with integrated Smart Control Box

Pos.	Symbol	Description
11		<p>MAC address label</p>

### 2.4.4 Label on the Colibri 3 Light Source

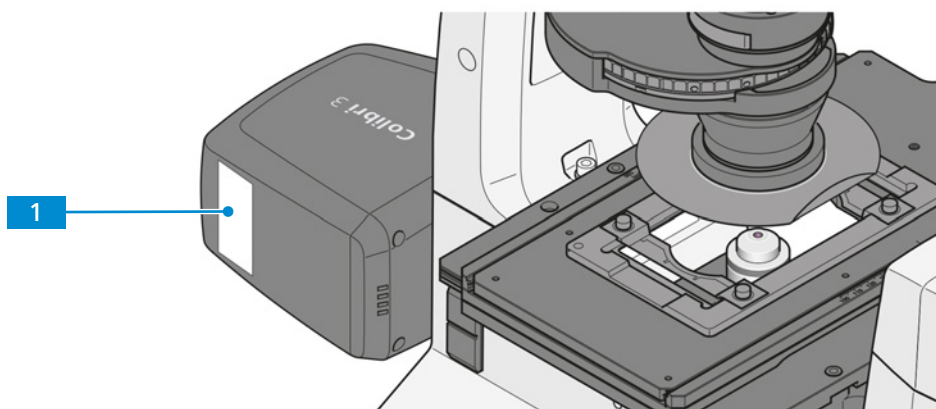



Fig. 4: Position of the warning label on the Colibri 3 light source

Pos.	Symbol	Description
1		<p>Risk group 3 according to IEC 62471</p> <p>WARNING: Possibly hazardous optical radiation emitted from this product. Do not look at operating lamp. Eye injury may result.</p> <p>WARNING: UV emitted from this product. Avoid eye and skin exposure to unshielded product.</p>

2.4.5 Warning Labels on Microscopes with LED Light Source for Reflected Light

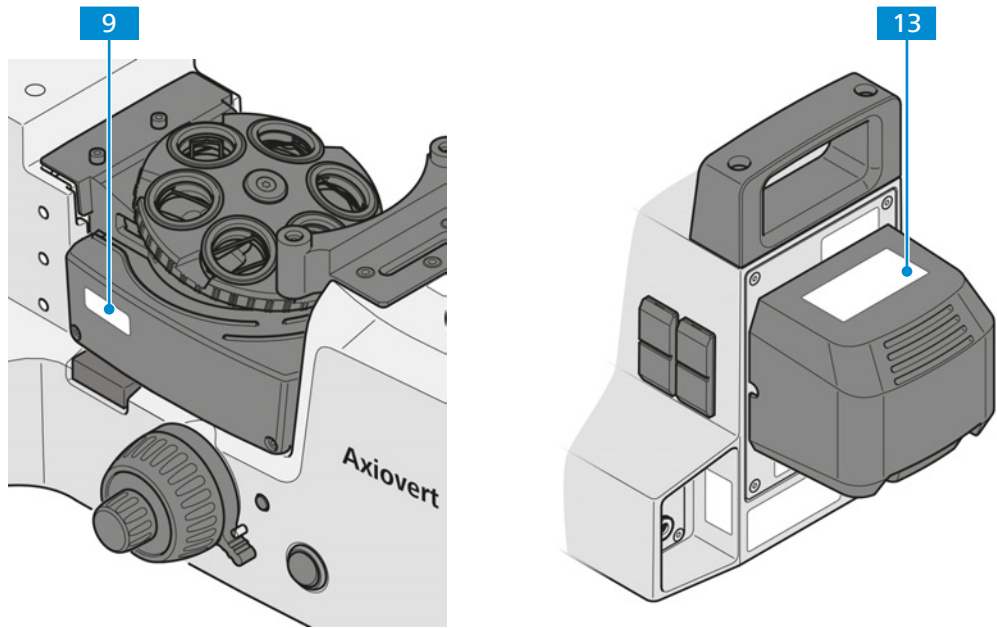




Fig. 5: Position of warning labels on microscopes with LED light source for reflected light

Pos.	Symbol	Description
9		LED aperture
13		<p>Risk Group 2 according to IEC 62471</p> <p>CAUTION: UV emitted from this product, eye or skin irritation may result from exposure. Use appropriate shielding.</p> <p>CAUTION: Possibly hazardous optical radiation emitted from this product. Do not stare at operating lamp. May be harmful to the eyes.</p>

## 3 Product and Functional Description

The Axiovert 5/7 is an inverted microscope of compact design with a small footprint. The microscope provides high resolution, infinity-corrected objectives for transmitted light techniques and for reflected light techniques, depending on the microscope type.

Depending on the configuration of the microscope, the following microscopy and contrast techniques are available:

- Transmitted light**
  - *Brightfield* [▶ 52] (BF)
  - *Phase contrast* [▶ 52] (Ph)
  - *Differential Interference Contrast* [▶ 53] (DIC)
  - *PlasDIC contrast* [▶ 53]
  - *Improved Hoffman Modulation Contrast* [▶ 53] (iHMC)
  - *Polarization contrast* [▶ 53] (Pol)
- Reflected light**
  - *Brightfield* [▶ 53] (BF)
  - *Darkfield* [▶ 53] (DF)
  - *Differential Interference Contrast (DIC) and Differential Interference Contrast in circularly polarized light* [▶ 54] (C-DIC)
  - *Polarization contrast* [▶ 54] (Pol)
  - *Fluorescence* [▶ 54] (FL)
  - *Total Interference Contrast* [▶ 54] (TIC)

The following microscope types are available:

431030-9050-000	Axiovert 5 TL	Inverted microscope for transmitted light
431030-9120-000	Axiovert 5 TL SCB	Inverted microscope for transmitted light with integrated Smart Control Box
431030-9060-000	Axiovert 5 TL FL SCB	Inverted microscope for transmitted and reflected light fluorescence with integrated Smart Control Box
431030-9070-000	Axiovert 5 RL SCB	Inverted microscope for reflected light with integrated Smart Control Box
431030-9080-000	Axiovert 7 RL	Inverted microscope for reflected light with motorized z drive
431030-9170-000	Axiovert 5 RL TL SCB	Inverted microscope for transmitted and reflected light with integrated Smart Control Box
431030-9180-000	Axiovert 7 RL TL	Inverted microscope for transmitted and reflected light with motorized z drive

### Typical Applications

- Axiovert 5
- medical examinations in laboratories, hospitals, and doctors' offices
  - academic and practical education in medicine and biology
  - industrial applications, e.g. in pharmacology, food technology, and wastewater examination
  - examination of blood and tissue samples taken from the human body, from plants, or animals

Axiovert 5/7 materials

- metallographic laboratories
- automotive industry
- microsystems engineering

- geoscientific institutes
- mineral exploration industry

### Info

For additional information and detailed descriptions, refer to further applicable documents or ask your ZEISS Sales & Service Partner.

## 3.1 Main Components

### 3.1.1 Axiovert 5 TL and Axiovert 5 TL SCB

This section shows the main components of Axiovert 5 TL and Axiovert 5 TL SCB.

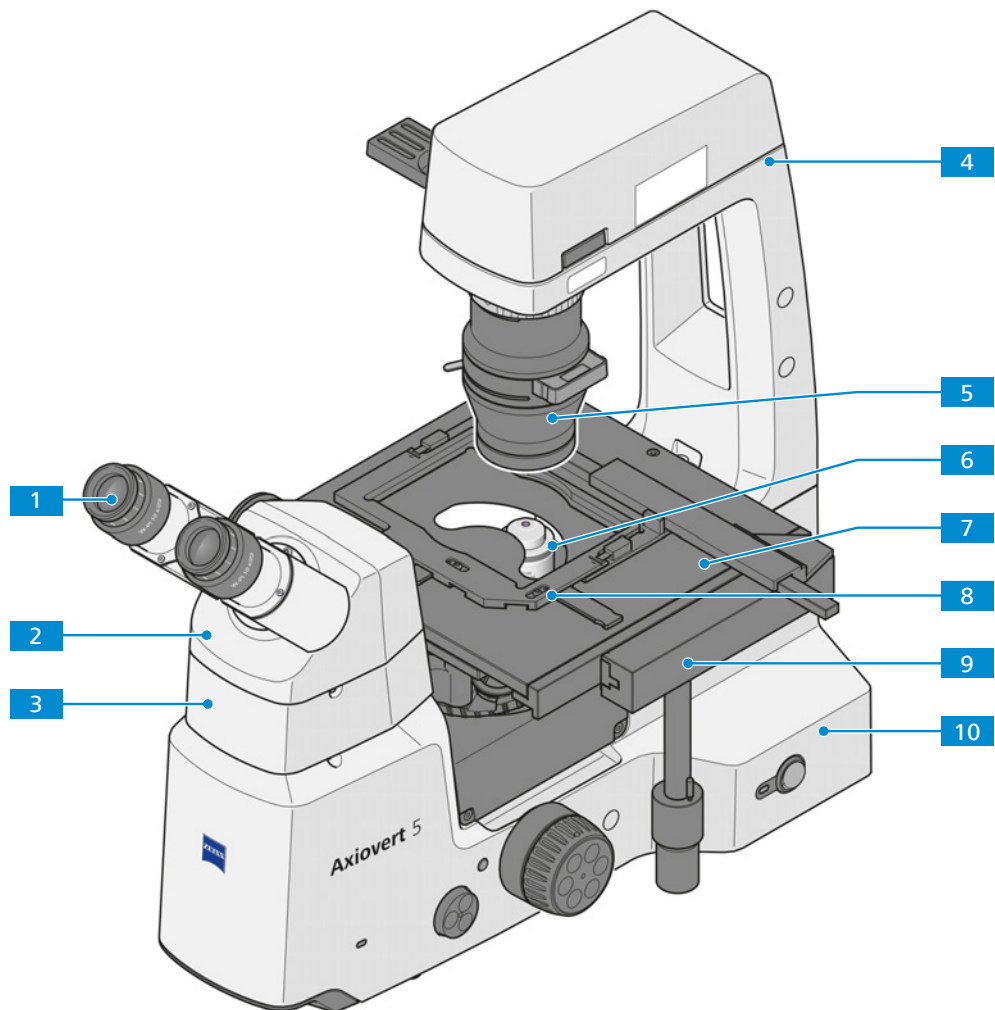


Fig. 6: Axiovert 5 TL and Axiovert 5 TL SCB - Main components

- |                                  |                                                                    |
|----------------------------------|--------------------------------------------------------------------|
| <b>1</b> Eyepiece [▶ 40]         | <b>2</b> Binocular phototube [▶ 38]                                |
| <b>3</b> Ergo intermediate piece | <b>4</b> Carrier transmitted light illumination with white LED 10W |
| <b>5</b> Condenser [▶ 43]        | <b>6</b> 6-position encoded nosepiece with objectives [▶ 40]       |
| <b>7</b> Specimen stage [▶ 47]   | <b>8</b> Mounting frame M                                          |
| <b>9</b> Object guide            | <b>10</b> Stand                                                    |

### 3.1.2 Axiovert 5 TL FL SCB

This section shows the main components of Axiovert 5 TL FL SCB.

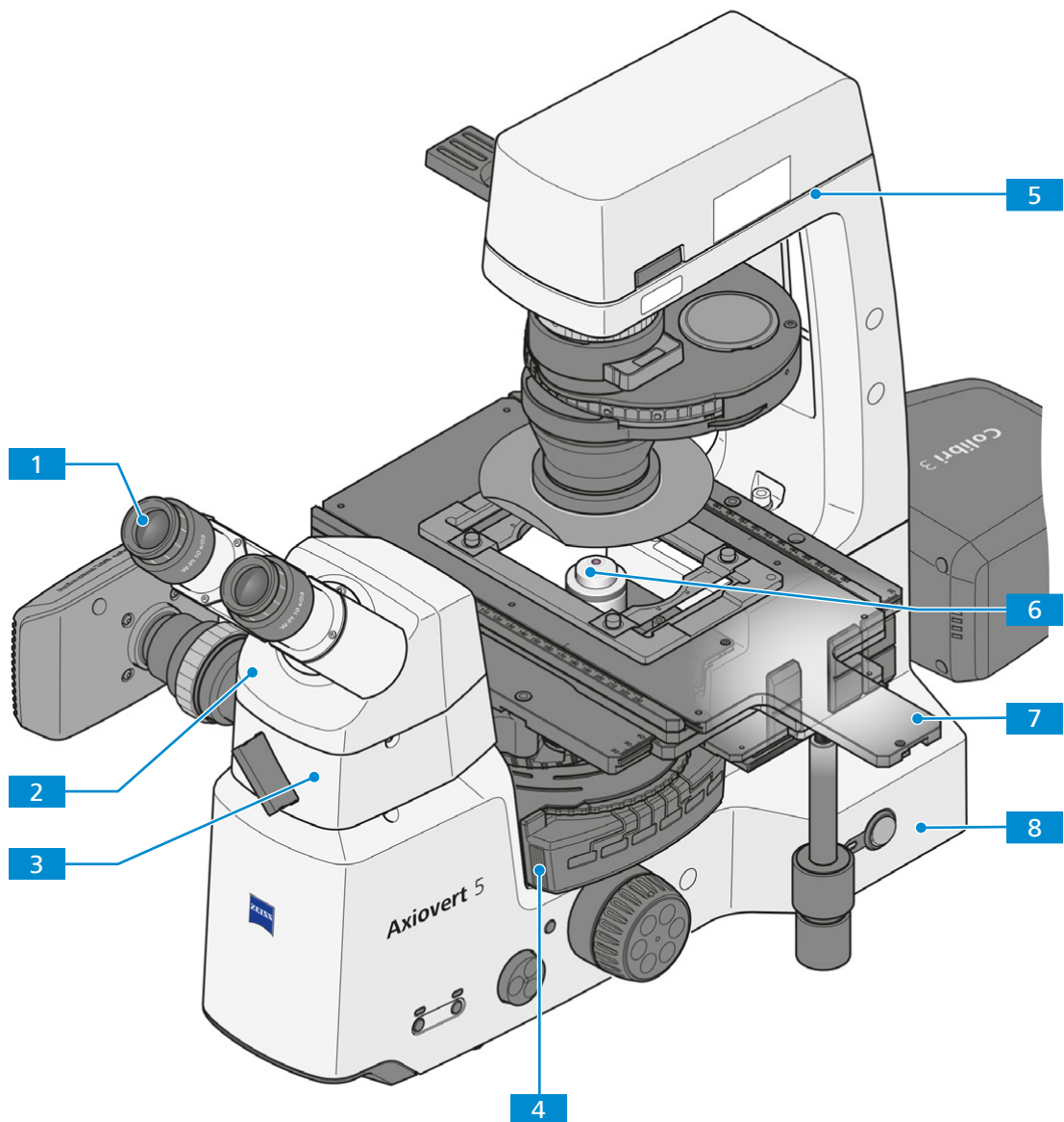


Fig. 7: Axiovert 5 TL FL SCB - Main Components

- |                                                                    |                                                                                |
|--------------------------------------------------------------------|--------------------------------------------------------------------------------|
| <b>1</b> Eyepiece [ <a href="#">▶ 40</a> ]                         | <b>2</b> Binocular tube                                                        |
| <b>3</b> Intermediate phototube [ <a href="#">▶ 39</a> ]           | <b>4</b> 6-position encoded reflector turret [ <a href="#">▶ 51</a> ]          |
| <b>5</b> Carrier transmitted light illumination with white LED 10W | <b>6</b> 6-position encoded nosepiece with objectives [ <a href="#">▶ 40</a> ] |
| <b>7</b> Mechanical stage [ <a href="#">▶ 48</a> ]                 | <b>8</b> Stand                                                                 |



### 3.1.3 Axiovert 5 RL SCB and Axiovert 7 RL

This section shows the main components of Axiovert 5 RL SCB and Axiovert 7 RL.

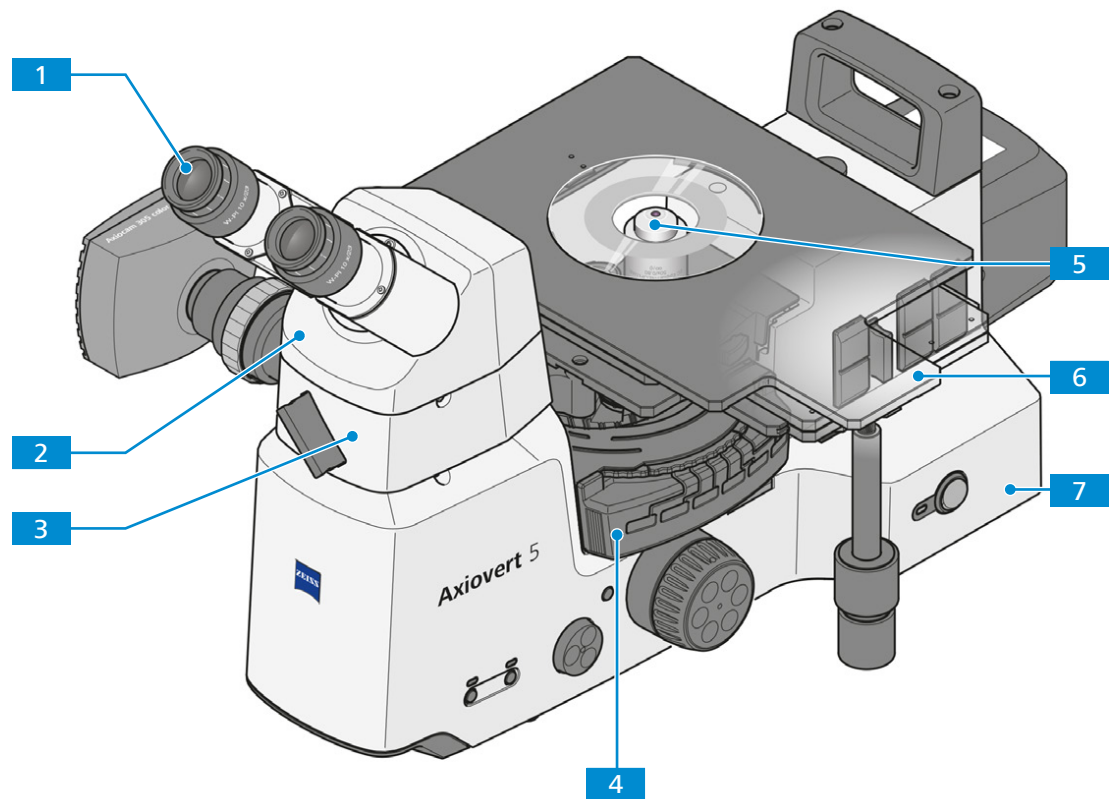


Fig. 8: Axiovert 5 RL SCB, Axiovert 7 RL - Main Components

- |                                                                                |                                                                               |
|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| <b>1</b> Eyepiece [ <a href="#">▶ 40</a> ]                                     | <b>2</b> Binocular tube                                                       |
| <b>3</b> Intermediate phototube [ <a href="#">▶ 39</a> ]                       | <b>4</b> 6-position encoded reflector turret [ <a href="#">▶ 51</a> ]         |
| <b>5</b> 6-position encoded nosepiece with objectives [ <a href="#">▶ 40</a> ] | <b>6</b> Mechanical stage 40x40 R/L, reflected light [ <a href="#">▶ 49</a> ] |
| <b>7</b> Stand                                                                 |                                                                               |

### 3.1.4 Axiovert 5 RL TL SCB and Axiovert 7 RL TL

This section shows the main components of Axiovert 5 RL TL SCB and Axiovert 7 RL TL.

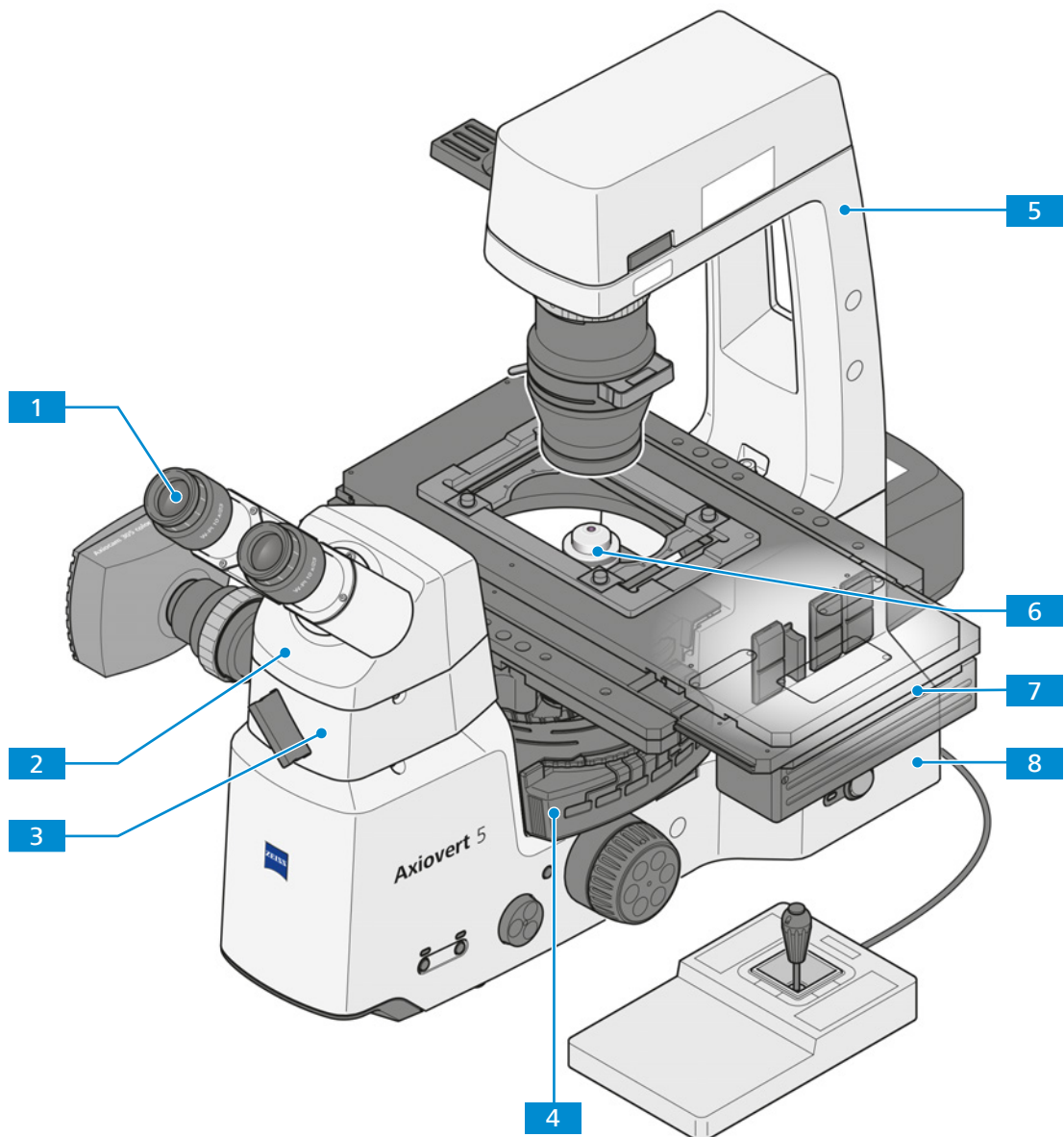


Fig. 9: Axiovert 5 RL TL SCB and Axiovert 7 RL TL - Main components

- |                                                                    |                                                              |
|--------------------------------------------------------------------|--------------------------------------------------------------|
| <b>1</b> Eyepiece [▶ 40]                                           | <b>2</b> Binocular tube                                      |
| <b>3</b> Intermediate phototube [▶ 39]                             | <b>4</b> 6-position encoded reflector turret [▶ 51]          |
| <b>5</b> Carrier transmitted light illumination with white LED 10W | <b>6</b> 6-position encoded nosepiece with objectives [▶ 40] |
| <b>7</b> Scanning stage 130x85 mot P; CAN [▶ 49]                   | <b>8</b> Stand                                               |

## 3.2 Controls and Functional Elements on Components

### 3.2.1 Axiovert 5 TL and Axiovert 5 TL SCB Stands

**Purpose** This section shows the functional components and controls of Axiovert 5 TL and Axiovert 5 TL SCB.

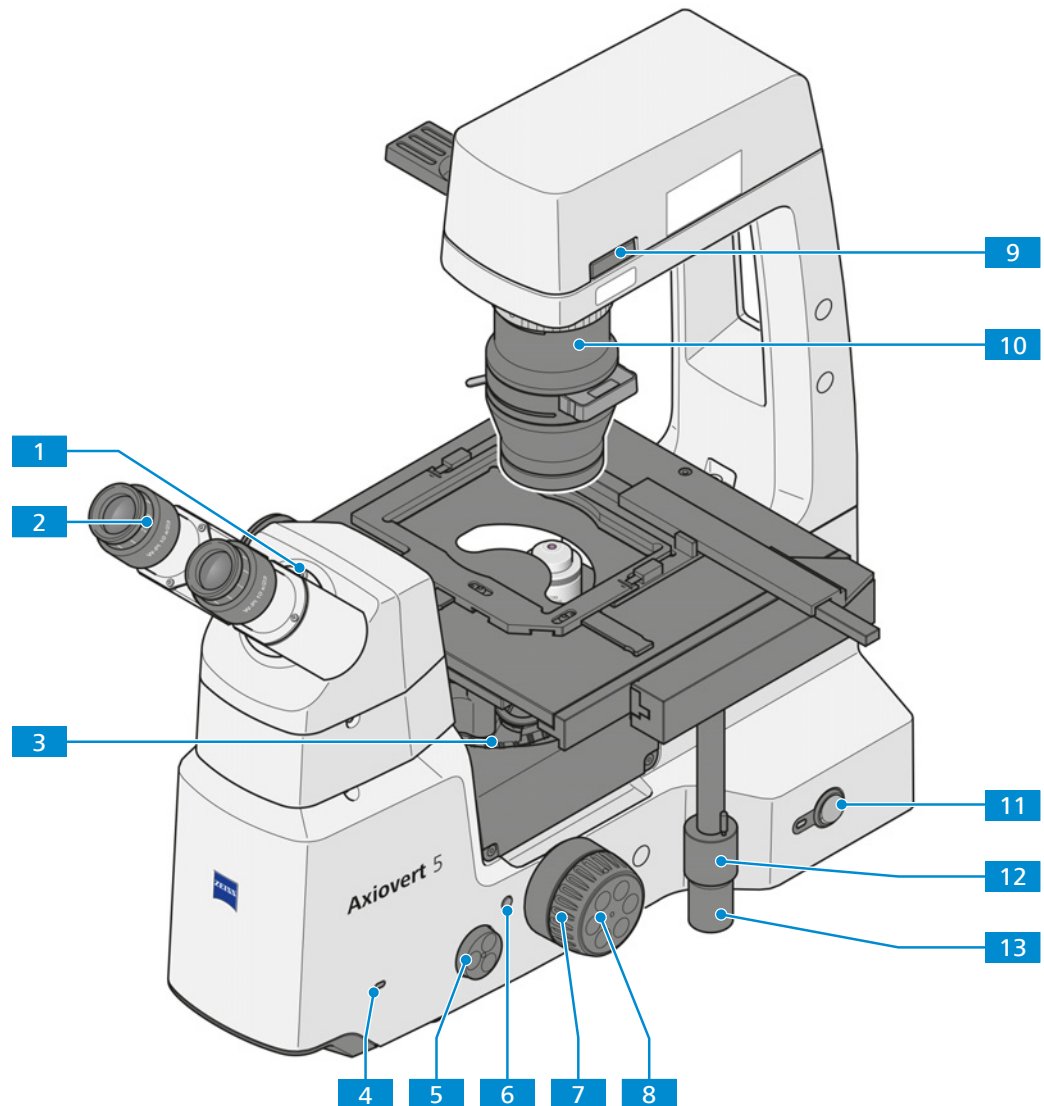


Fig. 10: Axiovert 5 TL and Axiovert 5 TL SCB - Controls and functional elements (right side)

- |                                                                                               |                                                                                                         |
|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| <b>1</b> Binocular phototube [▶ 38]                                                           | <b>2</b> Eyepieces                                                                                      |
| <b>3</b> <b>Knurled wheel</b> for changing the nose-piece position                            | <b>4</b> TL (Transmitted light) indicator                                                               |
| <b>5</b> <b>Intensity/LM knob</b> for light intensity and Light Manager function (LM)         | <b>6</b> <b>Snap button</b> (right and left side)                                                       |
| <b>7</b> <b>Focusing drive</b> – coarse adjustment                                            | <b>8</b> <b>Focusing drive</b> – fine adjustment                                                        |
| <b>9</b> Two-position filter slider mounted on the carrier for transmitted light illumination | <b>10</b> <b>Condenser</b> [▶ 43] (either condenser with modulator disk or condenser with slider mount) |
| <b>11</b> <b>Power switch</b> On/Off                                                          | <b>12</b> <b>Coaxial knurled knob</b> for Y adjustment                                                  |
| <b>13</b> <b>Coaxial knurled knob</b> for X adjustment                                        |                                                                                                         |

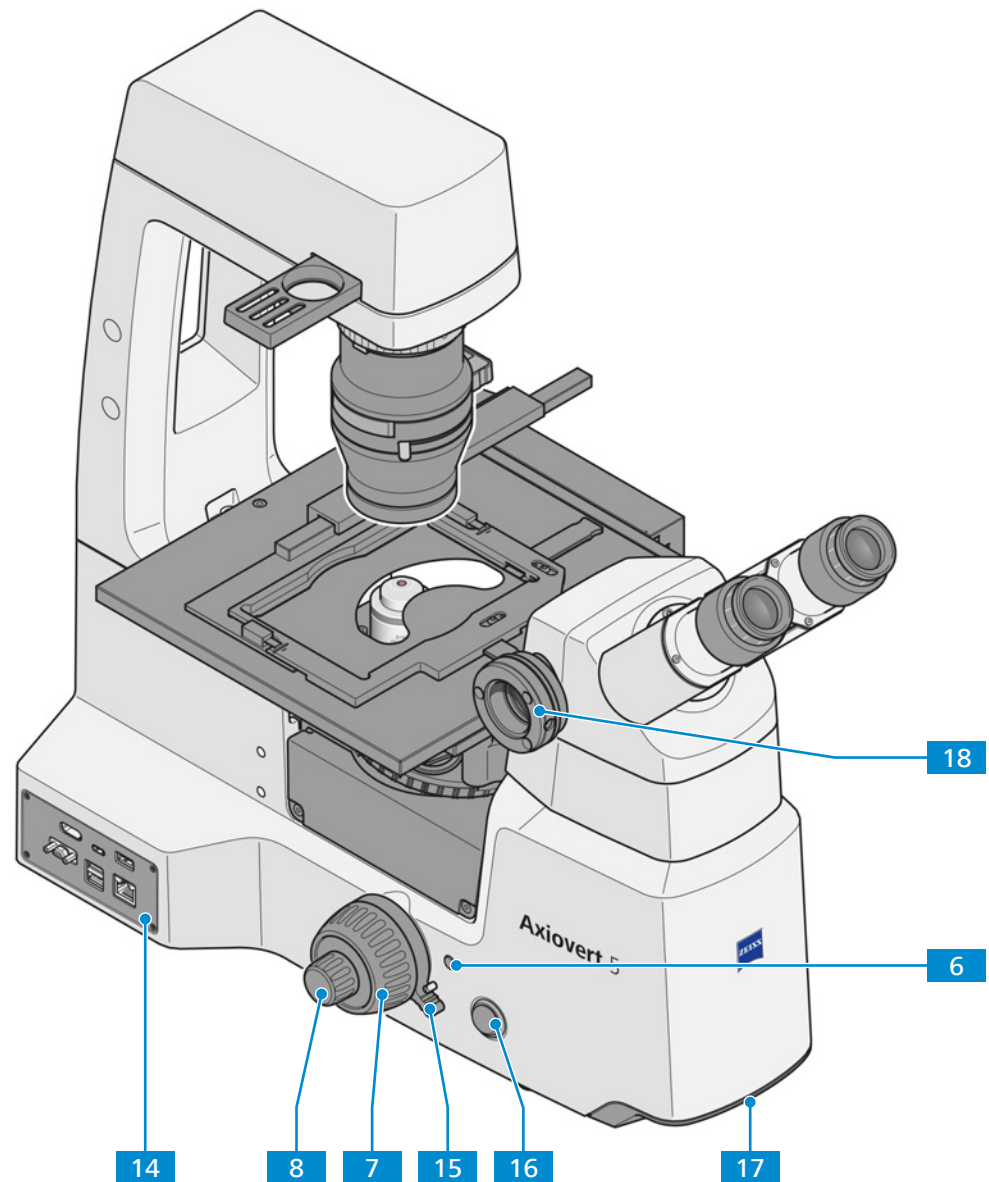


Fig. 11: Axiovert 5 TL and Axiovert 5 TL SCB - Controls and functional elements (left side)

- |                                                   |                                                                    |
|---------------------------------------------------|--------------------------------------------------------------------|
| <b>6</b> Snap button (right and left side)        | <b>7</b> Focusing drive – coarse adjustment                        |
| <b>8</b> Focusing drive – fine adjustment         | <b>14</b> Smart Control Box [▶ 50] (not included in Axiovert 5 TL) |
| <b>15</b> Release lever for adjustable focus stop | <b>16</b> Permanent/ECO mode switch                                |
| <b>17</b> Carrying handle                         | <b>18</b> Camera interface 60N                                     |

### 3.2.2 Axiovert 5 TL FL SCB Stand

**Purpose** This section shows the functional components and controls of stand 5 TL FL SCB.

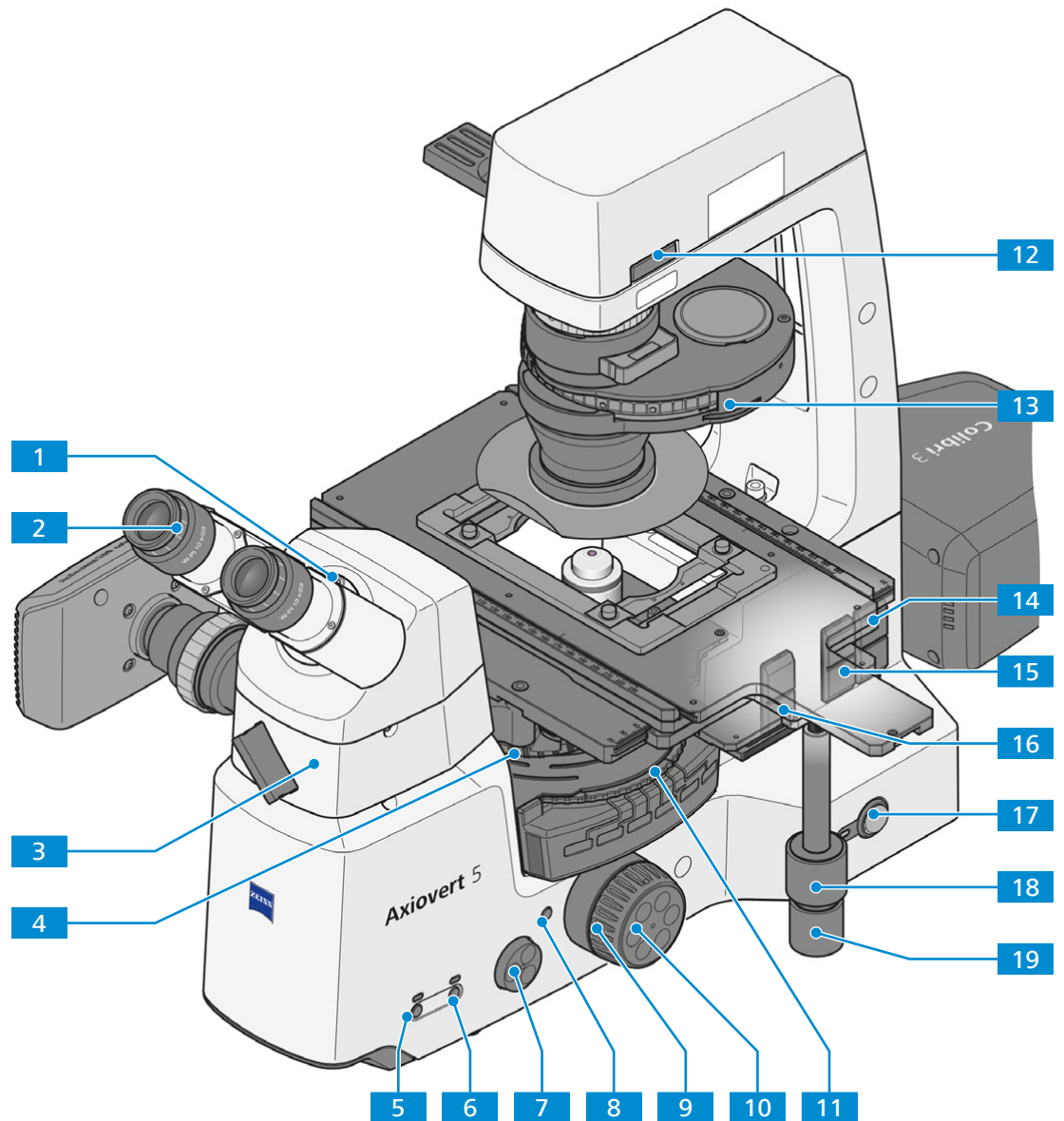


Fig. 12: Axiovert 5 TL FL SCB - Controls and functional elements (right side)

- |                                                                                                           |                                                                                                |
|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| <b>1</b> Binocular tube                                                                                   | <b>2</b> Eyepieces                                                                             |
| <b>3</b> Intermediate phototube [▶ 39]                                                                    | <b>4</b> <b>Knurled wheel</b> for changing the nose-piece position                             |
| <b>5</b> <b>TL</b> (Transmitted light) button with indicator                                              | <b>6</b> <b>RL</b> (Reflected light) button with indicator                                     |
| <b>7</b> <b>Intensity/LM</b> knob for light intensity, Colibri 3 control, and Light Manager function (LM) | <b>8</b> <b>Snap</b> button (right and left side)                                              |
| <b>9</b> <b>Focusing drive</b> – coarse adjustment                                                        | <b>10</b> <b>Focusing drive</b> – fine adjustment                                              |
| <b>11</b> <b>Knurled wheel</b> for changing the reflector turret position                                 | <b>12</b> Two-position filter slider mounted on the carrier for transmitted light illumination |

- 13** Condenser [[▶ 43](#)] (either condenser with modulator disk or condenser with slider mount)
- 14** Slot for filter slider (right and left side)
- 15** Slot A for aperture diaphragm slider or attenuator
- 16** Slot F for luminous field diaphragm slider
- 17** **Power** switch On/Off
- 18** **Coaxial knurled knob** for Y adjustment
- 19** **Coaxial knurled knob** for X adjustment

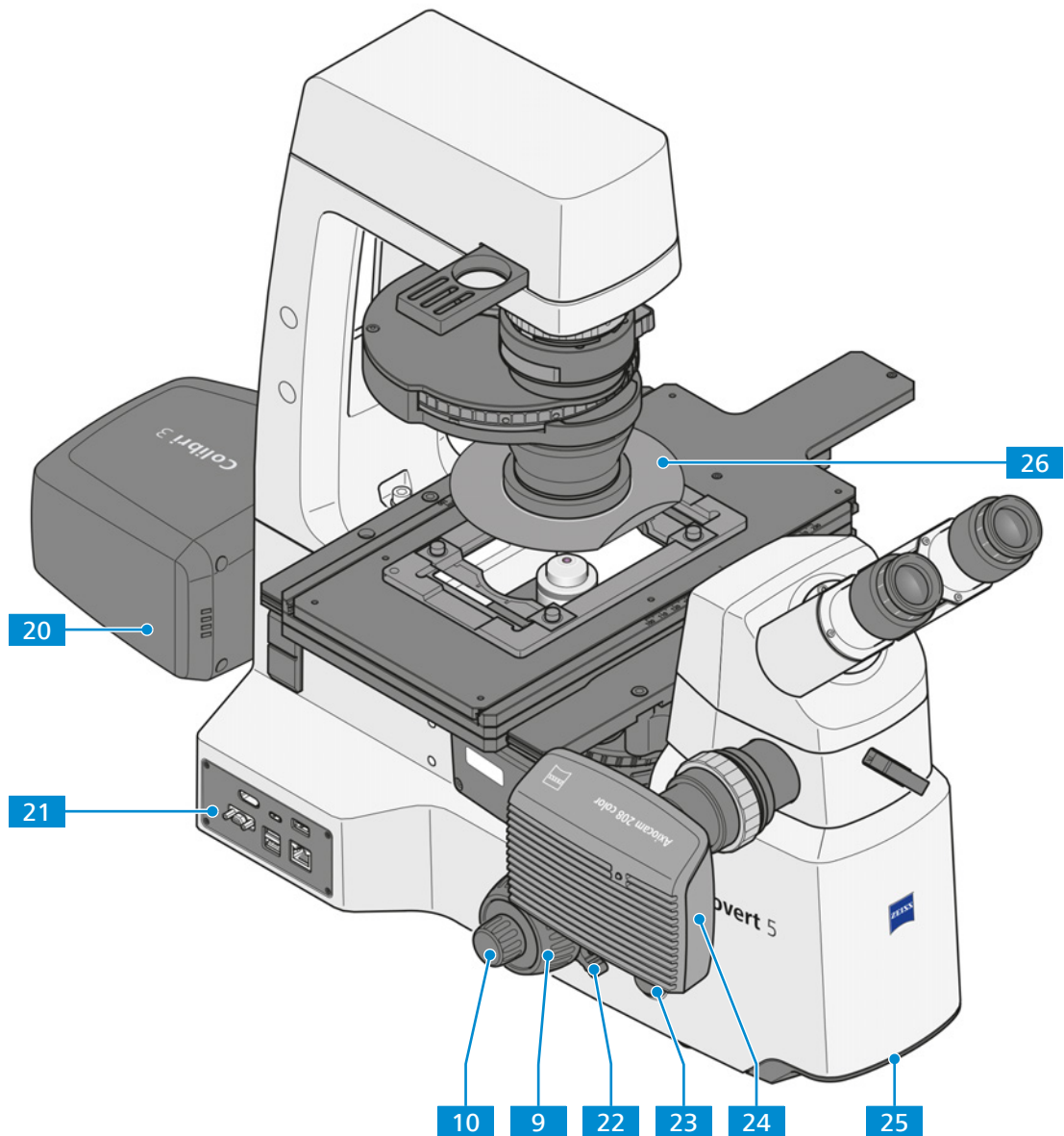


Fig. 13: Axiovert 5 TL FL SCB - Controls and functional elements (left side)

- 9** **Focusing drive** – coarse adjustment
- 10** **Focusing drive** – fine adjustment
- 20** Solid-state light source Colibri 3
- 21** **Smart Control Box** [[▶ 50](#)]
- 22** **Release lever** for adjustable focus stop
- 23** **Permanent/ECO mode** switch
- 24** Axiocam
- 25** Carrying handle
- 26** Light shield

### 3.2.3 Axiovert 5 RL SCB and Axiovert 7 RL Stands

**Purpose** This section shows the functional components and controls of Axiovert 5 RL SCB and Axiovert 7 RL.

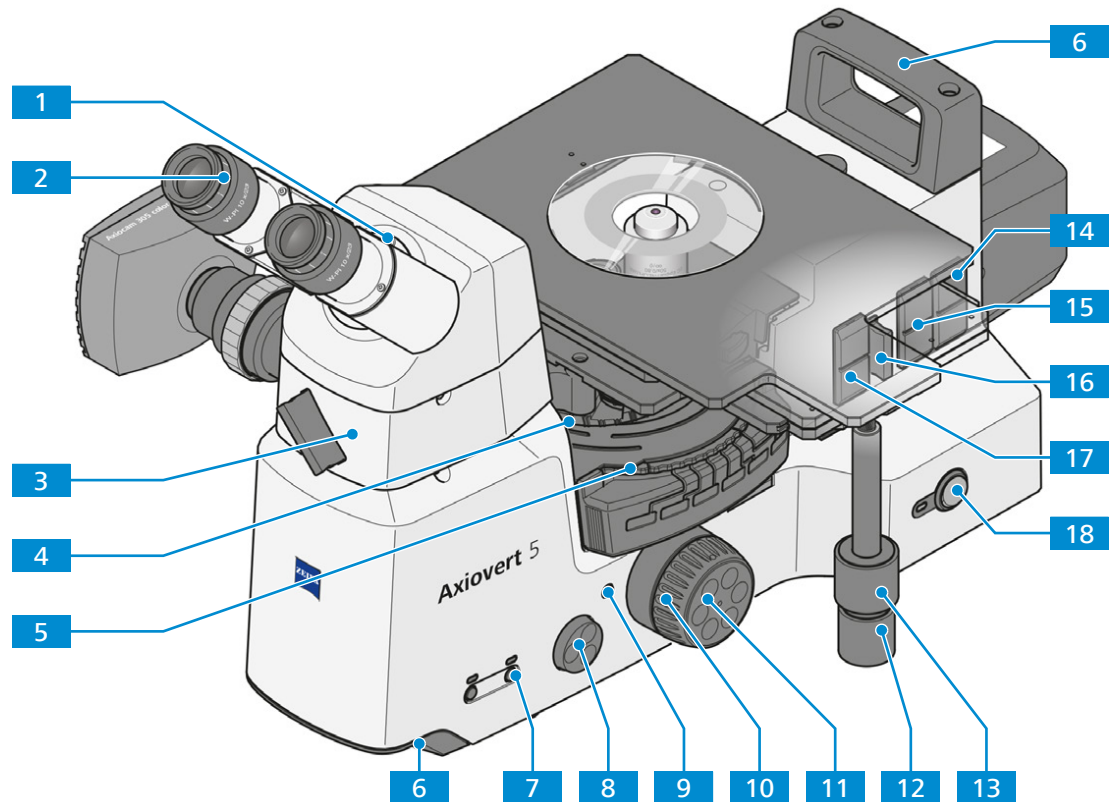


Fig. 14: Axiovert 5 RL SCB and Axiovert 7 RL - Controls and functional elements (right side)

- |                                                                          |                                                                                       |
|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>1</b> Binocular tube                                                  | <b>2</b> Eyepieces                                                                    |
| <b>3</b> <i>Intermediate phototube</i> [▶ 39]                            | <b>4</b> <b>Knurled wheel</b> for changing the nose-piece position                    |
| <b>5</b> <b>Knurled wheel</b> for changing the reflector turret position | <b>6</b> Carrying handles                                                             |
| <b>7</b> <b>RL</b> (Reflected light) button with indicator               | <b>8</b> <b>Intensity/LM knob</b> for light intensity and Light Manager function (LM) |
| <b>9</b> <b>Snap button</b> (right and left side)                        | <b>10</b> <b>Focusing drive</b> – coarse adjustment                                   |
| <b>11</b> <b>Focusing drive</b> – fine adjustment                        | <b>12</b> <b>Coaxial knurled knob</b> for X adjustment                                |
| <b>13</b> <b>Coaxial knurled knob</b> for Y adjustment                   | <b>14</b> Slot for filter sliders (right and left side)                               |
| <b>15</b> Slot A for aperture diaphragm slider or attenuator             | <b>16</b> Slot P for polarizer slider                                                 |
| <b>17</b> Slot F for luminous field diaphragm slider                     | <b>18</b> <b>Power switch</b> On/Off                                                  |

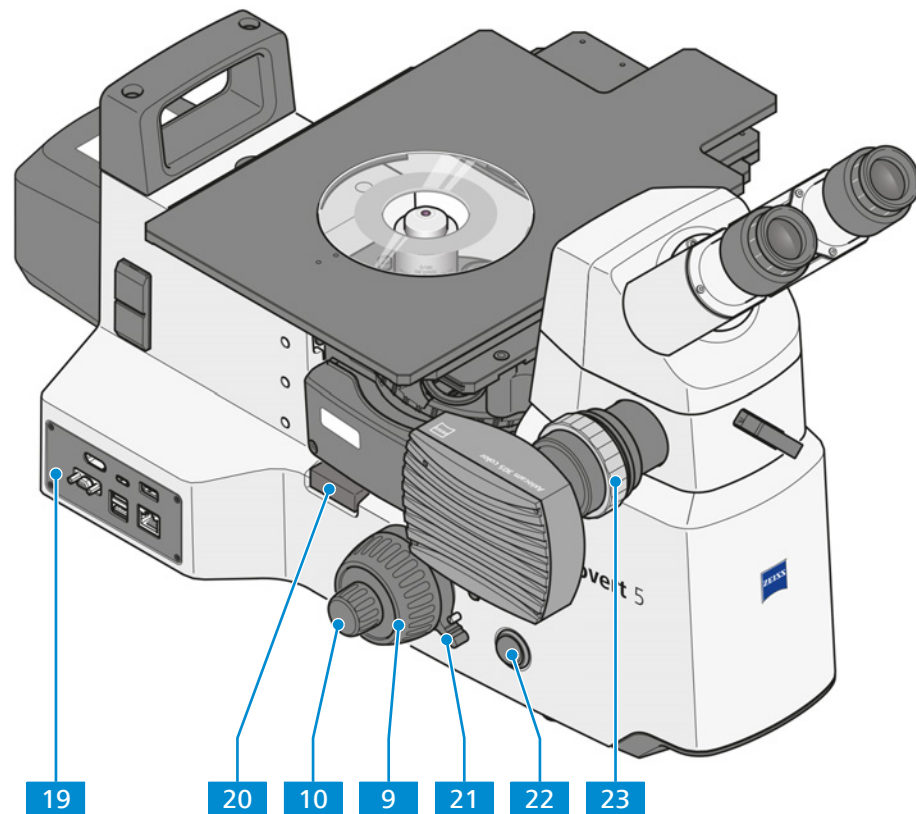


Fig. 15: Axiovert 5 RL SCB and Axiovert 7 RL - Controls and functional elements (left side)

- |                                                                           |                                                     |
|---------------------------------------------------------------------------|-----------------------------------------------------|
| <b>9</b> <b>Focusing drive</b> – coarse adjustment                        | <b>10</b> <b>Focusing drive</b> – fine adjustment   |
| <b>19</b> <i>Smart Control Box [▶ 50]</i> (not included in Axiovert 7 RL) | <b>20</b> 12x35 mm slider mount for analyzer slider |
| <b>21</b> <b>Release lever</b> for adjustable focus stop                  | <b>22</b> <b>Permanent/ECO mode</b> switch          |
| <b>23</b> Axioacam                                                        |                                                     |



### 3.2.4 Axiovert 5 RL TL SCB and Axiovert 7 RL TL Stands

**Purpose** This section shows the functional components and controls of Axiovert 5 RL TL SCB and Axiovert 7 RL TL.

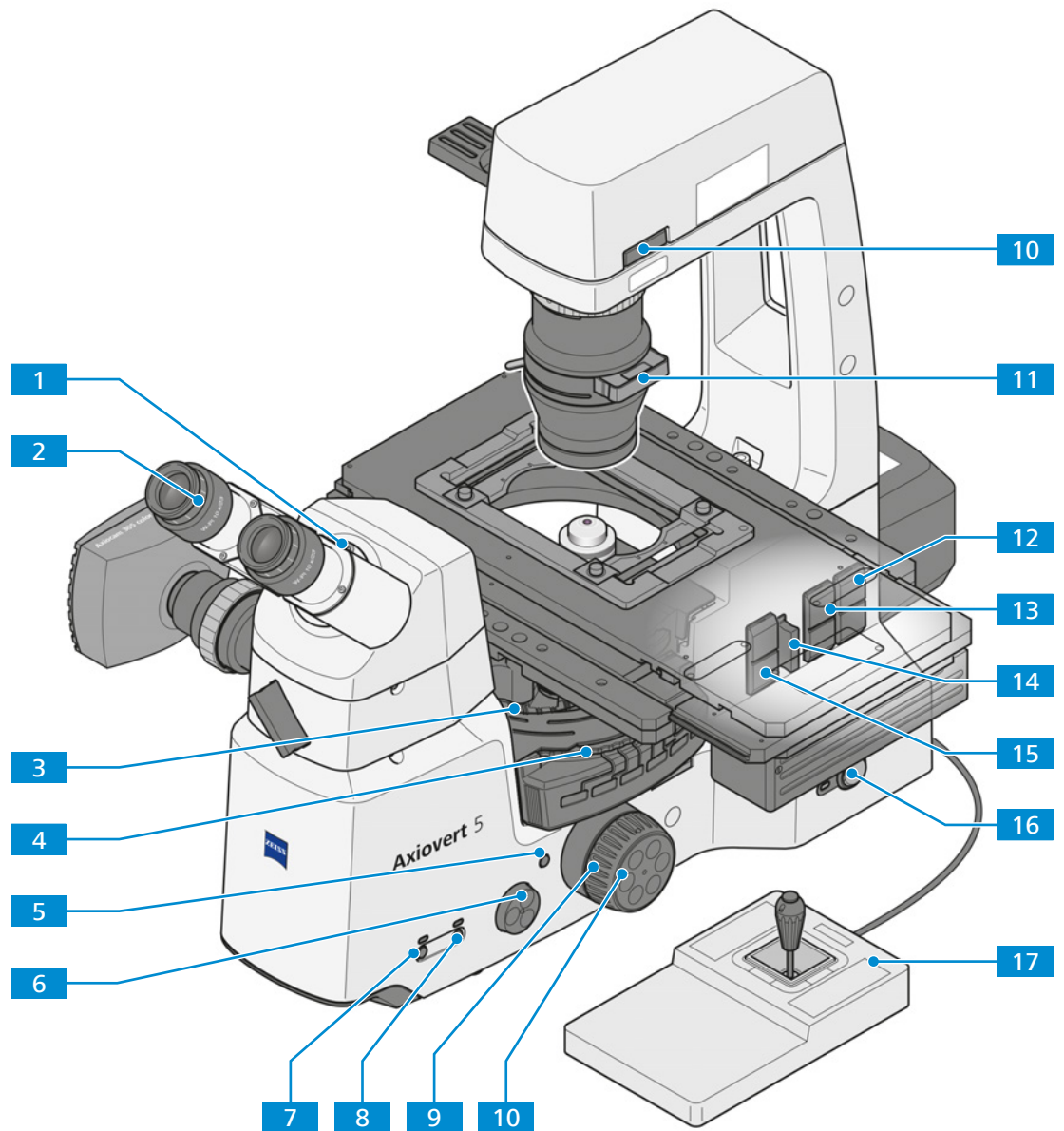


Fig. 16: Axiovert 5 RL TL SCB and Axiovert 7 RL TL - Controls and functional elements (right side)

- |                                                                                                |                                                                                       |
|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>1</b> Binocular tube                                                                        | <b>2</b> Eyepieces                                                                    |
| <b>3</b> <b>Knurled wheel</b> for changing the nose-piece position                             | <b>4</b> <b>Knurled wheel</b> for changing the reflector turret position              |
| <b>5</b> <b>Snap</b> button (right and left side)                                              | <b>6</b> <b>Intensity/LM</b> knob for light intensity and Light Manager function (LM) |
| <b>7</b> <b>TL</b> (Transmitted light) button with indicator                                   | <b>8</b> <b>RL</b> (Reflected light) button with indicator                            |
| <b>9</b> <b>Focusing drive</b> – coarse adjustment                                             | <b>10</b> <b>Focusing drive</b> – fine adjustment                                     |
| <b>11</b> Two-position filter slider mounted on the carrier for transmitted light illumination | <b>12</b> Slot for filter sliders (right and left side)                               |

- 13** Slot A for aperture diaphragm slider or attenuator
- 14** Slot P for polarizer slider
- 15** Slot F for luminous field diaphragm slider
- 16** **Power** switch On/Off
- 17** **Joystick** for scanning stage control

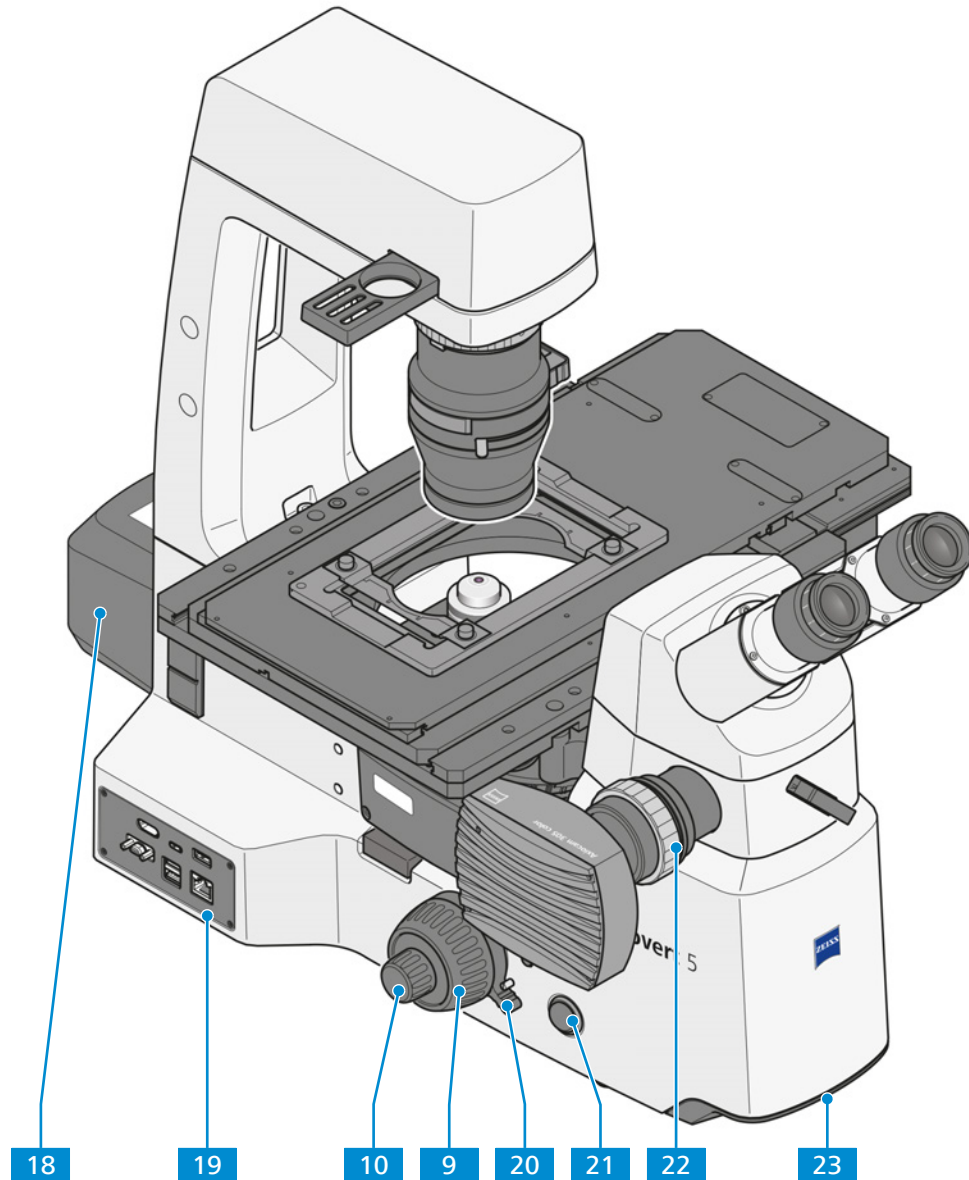


Fig. 17: Axiovert 5 RL TL SCB and Axiovert 7 RL TL - Controls and functional elements (left side)

- 9** **Focusing drive** – coarse adjustment
- 10** **Focusing drive** – fine adjustment
- 18** Reflected light (RL) light source
- 19** *Smart Control Box [▶ 50]* (not included in Axiovert 7 RL TL)
- 20** **Release lever** for height stop on focusing drive
- 21** **Permanent/ECO mode** switch
- 22** AxioCam
- 23** Carrying handle

### 3.2.5 Functions of Stand Keys and Display Elements

Key	Availability	Action	Functionality/Description
<b>Power switch On/Off</b>	all types	I = on; O = off	Switches the microscope on/off
<b>Permanent/ECO mode switch</b>	all types	Toggle	Switches between Permanent (continuous) mode and ECO mode of the microscope illumination. <ul style="list-style-type: none"> <li>Permanent mode active: illumination is continuously switched on.</li> <li>ECO mode active: illumination switches off after 15 minutes without action.</li> </ul> Don't use ECO mode for experiments involving time-lapse or video recording.
TL LED Illumination indicator light	Axiovert 5 TL, Axiovert 5 TL SCB	on	Indicates TL light source function (on/off)
<b>RL button, TL button</b> with LED indicator lights	Axiovert 5 TL FL SCB, Axiovert 5 RL SCB, Axiovert 5 RL TL SCB, Axiovert 7 RL, Axiovert 7 RL TL	Short press*	Switches on and off the TL or RL illumination, see <i>TL/RL Button</i> [▶ 36].
<b>Intensity/LM knob</b>	all types	Turn	Controls the light intensity of the active light source.
		Long press**	Light Manager function: <i>Saves the set light intensity</i> [▶ 86].
		Long press for 20 s	<i>Resets the microscope to the factory settings</i> [▶ 139].
	Axiovert 5 TL FL SCB with Colibri 3 LED light source	Short press*	Repeated short pressing switches a single LED or all LEDs of the Colibri 3 LED light source together on or off.
<b>Snap button</b> (left or right)	all types	Short press*	Snaps an image; when the snap is completed, the attached monitor appears in BLACK for 50 ms.
		Long press**	Starts video recording; another short press is required to stop recording. After recording is finished, the attached monitor appears in BLACK for 300 ms.
<b>Right Snap button + Intensity/LM knob</b>	all types	Long press** (simultaneously)	Light Manager function: <i>Switches the Light Manager (LM) functionality on and off</i> [▶ 86].
<b>Left Snap button</b>	Axiovert 7 RL, Axiovert 7 RL TL	Long press > 8 seconds (simultaneously)	Switches the parfocality alignment mode on: LED blinks*** RED. Switches the parfocality alignment mode off: LED blinks*** GREEN.

Key	Availability	Action	Functionality/Description
Left <b>Snap button</b> + <b>Intensity/LM knob</b>	Axiovert 7 RL, Axiovert 7 RL TL	Long press** (simultaneously)	Switches parfocal function on: LED blinks*** GREEN twice. Switches parfocal function off: LED blinks*** orange twice.
Left <b>Snap button</b>	Axiovert 7 RL, Axiovert 7 RL TL	Short press**	<i>Saves the parfocal position [▶ 87].</i> The LED appears in BLACK for 300 ms.

\* Short press means: hold less than 1 second, then release.

\*\* Long press means: hold at least 1.5 seconds.

\*\*\* Blinking: the indicator light alternately goes on/off at 500 ms intervals

### 3.2.6 TL/RL Button

The present section applies to the following microscope types:

- Axiovert 5 TL FL SCB
- Axiovert 5 RL SCB
- Axiovert 5 RL TL SCB
- Axiovert 7 RL
- Axiovert 7 RL TL

Depending on the configuration of the microscope, the TL and RL indicators can indicate the following states:

TL indicator	RL indicator	Description
off	off	TL and RL illumination are switched off. <ul style="list-style-type: none"> <li>▪ Pressing the TL button switches on the TL illumination.</li> <li>▪ Pressing the RL button switches on the RL illumination.</li> </ul>
green	off	TL illumination is in use. <ul style="list-style-type: none"> <li>▪ Pressing the TL button switches off the TL illumination.</li> <li>▪ Pressing the RL button switches on the RL illumination. The TL illumination is switched off.</li> </ul>
off	green	RL illumination is in use. <ul style="list-style-type: none"> <li>▪ Pressing the RL button switches off the RL illumination.</li> <li>▪ Pressing the TL button switches on the TL illumination. The RL illumination is switched off.</li> </ul>
flashing orange	off	TL illumination is in use. Nosepiece or reflector turret are not in the correct click stop position.
off	flashing orange	RL illumination is in use. Nosepiece or reflector turret are not in the correct click stop position.
flashing red	off	TL illuminator lost connection to the main control board. Connectors must be checked.
off	flashing red	RL illuminator lost connection to the main control board. Connectors must be checked.

### 3.2.7 Binocular Tubes

#### 3.2.7.1 Binocular Tube 45°/23

**Purpose** Binocular tubes are used to visualize the microscopic image by means of the eyepieces.

**Position** The binocular tubes are mounted on the top of the stand.

**Function** The pupil distance and the viewing height can be adjusted with the aid of the binocular section.

- upright and unreversed image
- viewing angle 45°
- field of view 23 mm

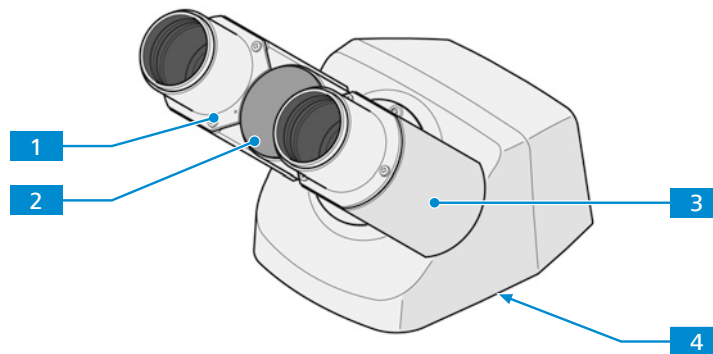


Fig. 18: Binocular tube 45°/23

- |                            |                               |
|----------------------------|-------------------------------|
| <b>1</b> Eyepiece socket   | <b>2</b> Pupil distance scale |
| <b>3</b> Binocular section | <b>4</b> Dovetail ring mount  |

#### 3.2.7.2 Binocular Ergotube 30-60°/23

**Purpose** Binocular tubes are used to visualize the microscopic image by means of the eyepieces.

**Position** The binocular tubes are mounted on the top of the stand.

**Function** The pupil distance and the viewing height can be adjusted with the aid of the binocular section.

- upright and unreversed image
- continuous angle adjustment between 30° and 60°
- field of view 23 mm

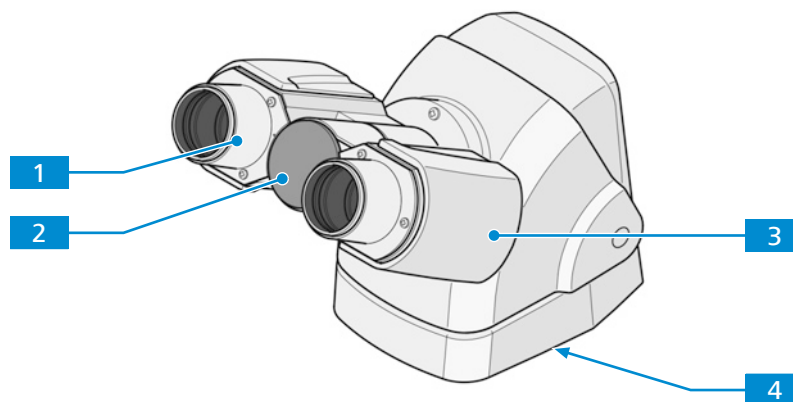


Fig. 19: Binocular Ergotube 30-60°/23

- |                            |                               |
|----------------------------|-------------------------------|
| <b>1</b> Eyepiece socket   | <b>2</b> Pupil distance scale |
| <b>3</b> Binocular section | <b>4</b> Dovetail ring mount  |

### 3.2.7.3 Binocular Phototube 45°/23 (50:50)

**Purpose** Binocular tubes are used to visualize the microscopic image by means of the eyepieces.

**Position** The binocular tubes are mounted on the top of the stand.

**Function** The pupil distance and the viewing height can be adjusted with the aid of the binocular section.

- upright and unreversed image
- camera port with interface 60N
- camera port with fixed light graduation (50:50)
- viewing angle 45°
- field of view 23 mm

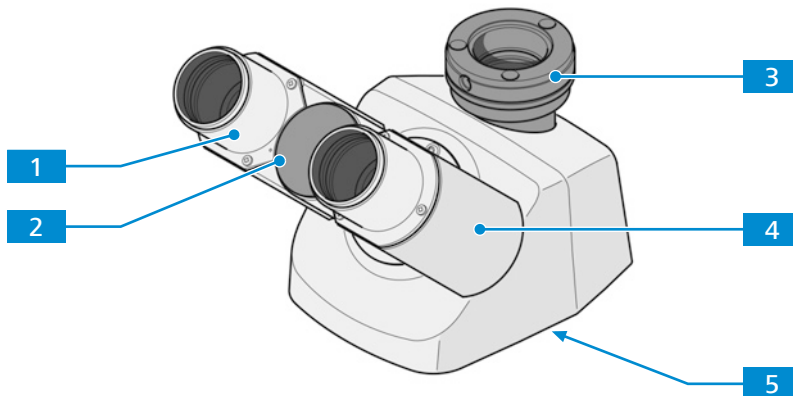


Fig. 20: Binocular phototube 45°/23 (50:50)

- |                              |                               |
|------------------------------|-------------------------------|
| <b>1</b> Eyepiece socket     | <b>2</b> Pupil distance scale |
| <b>3</b> Camera port         | <b>4</b> Binocular section    |
| <b>5</b> Dovetail ring mount |                               |

### 3.2.7.4 Binocular Phototube, Left Port 45°/23 (50:50)

**Purpose** Binocular tubes are used to visualize the microscopic image by means of the eyepieces.

**Position** The binocular tubes are mounted on the top of the stand.

**Function** The pupil distance and the viewing height can be adjusted with the aid of the binocular section.

- upright and unreversed image
- camera port with interface 60N
- camera port with fixed light graduation (50:50) on the left side
- viewing angle 45°
- field of view 23 mm

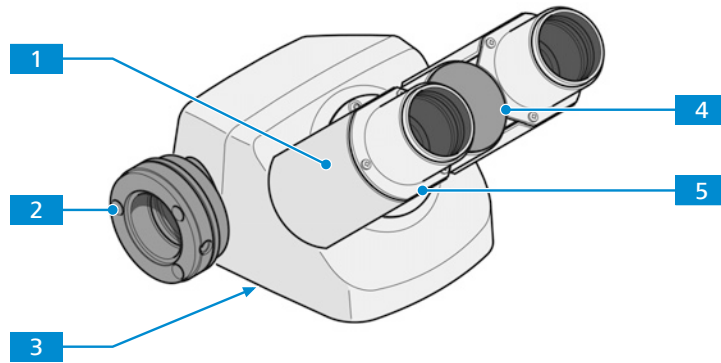


Fig. 21: Binocular phototube, left port 45°/23 (50:50)

- |                              |                               |
|------------------------------|-------------------------------|
| <b>1</b> Binocular section   | <b>2</b> Camera port          |
| <b>3</b> Dovetail ring mount | <b>4</b> Pupil distance scale |
| <b>5</b> Eyepiece socket     |                               |

### 3.2.7.5 Intermediate Phototube H = 50 mm, Left Port

**Purpose** Intermediate tubes are used to direct the light to the eyepieces, to the attached camera or to both simultaneously.

**Position** The intermediate tube is mounted between the stand and the binocular tube.

The following features are available:

- camera port with interface 60N
- camera installed on the left side
- slider with mirror or beam splitters with two positions
- If the slider with 100% mirror is used:
  - Position 1: 100 % of the light is directed to eyepieces
  - Position 2: 100 % of the light is directed to the camera
- If the slider with beam splitter 50:50 is used:
  - Position 1: 100 % of the light is directed to eyepieces
  - Position 2: 50 % of the light is directed to eyepieces and 50 % to camera
- If the slider with beam splitter 20:80 is used:
  - Position 1: 100 % of the light is directed to eyepieces
  - Position 2: 20 % of the light is directed to eyepieces and 80 % to camera

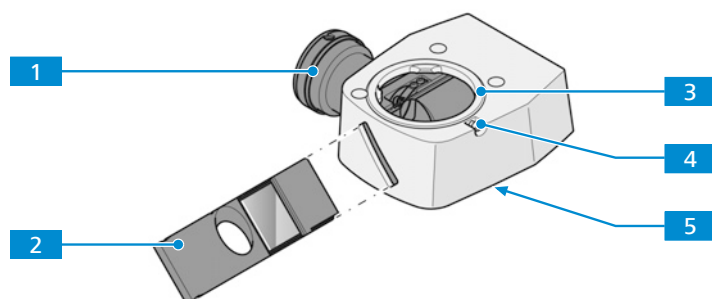


Fig. 22: Intermediate Phototube H = 50 mm, Left Port

- |                                        |                                              |
|----------------------------------------|----------------------------------------------|
| <b>1</b> Camera port                   | <b>2</b> Slider with beam splitter or mirror |
| <b>3</b> Dovetail ring mount for tube  | <b>4</b> Fixing screw                        |
| <b>5</b> Dovetail ring mount for stand |                                              |

### 3.2.8 Eyepieces

- Purpose** The eyepieces serve to observe the microscopic image.
- Position** The eyepieces are inserted into the tube.
- Function** Both eyepieces are suitable for spectacle wearers. Additionally, they contain a focusing ring for compensation of defective vision. The provided diopter scale helps to find the correct setting. When using the microscope for fluorescence applications, the special eyecups with light protection can be used. However, they cannot be folded over and are not suitable for spectacle wearers.

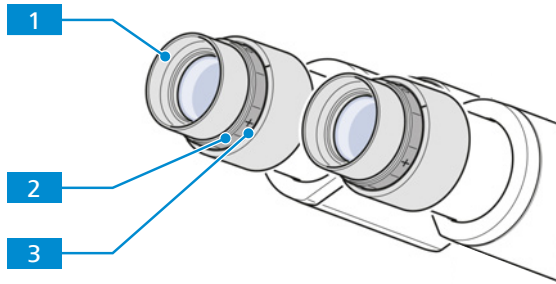


Fig. 23: Eyepiece

- |                                                                                                            |                                                                    |
|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| <p><b>1</b> Eyecup, changeable</p> <p><b>3</b> Diopter scale to facilitate finding the correct setting</p> | <p><b>2</b> Focusing ring for compensation of defective vision</p> |
|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|

### 3.2.9 Nosepiece with Objectives

- Purpose** The nosepiece is used to hold the objectives and to swivel the desired objective into the beam path.
- Position** The nosepiece is mounted on the lower part of the stand.
- The following features and controls are available:
- encoded nosepiece with M27 mounting thread for six objectives
  - equipped with 6 slots for DIC sliders

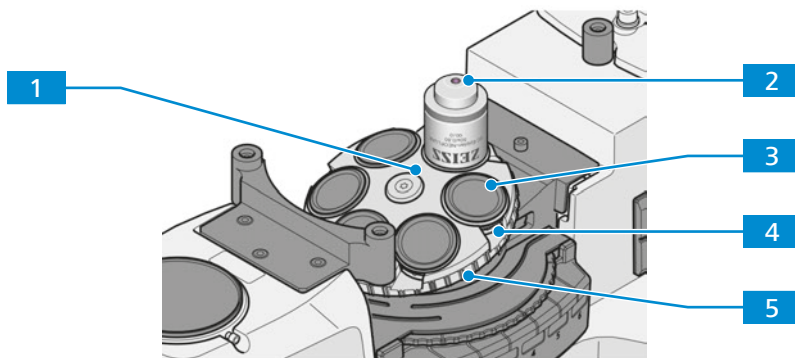


Fig. 24: Nosepiece with objectives

- |                                                                                                                |                                                               |
|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| <p><b>1</b> Nosepiece</p> <p><b>3</b> Cover cap</p> <p><b>5</b> Knurled ring for swivelling the nose-piece</p> | <p><b>2</b> Objective</p> <p><b>4</b> Slot for DIC slider</p> |
|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|



### 3.2.10 Objective Labeling

**Purpose** The objective is a light collecting optical system.

**Position** The objective is screwed into the nosepiece.

The selection of objectives co-determines the fields of use that the microscope can reasonably cover.



Fig. 25: Objective labeling

Pos.	Designation	Value (example)
1	Objective class	e.g. LD A-Plan, Plan-Apochromat, Fluor
2	Magnification	
3	Optical System	ICS- Optic $\infty$
4	Color coding of scale number	See <a href="#">2</a> .
5	Contrast method	Black = Standard Red = Pol/DIC Green = Ph 0, Ph 1, Ph 2, Ph 3
6	Numerical Aperture	e.g. 0.25
7	Application	<ul style="list-style-type: none"> <li>Immersion Medium (Oil / W/ Glyc)</li> <li>Adjustable cover glass correction (Corr.)</li> <li>Contrast method. See <a href="#">5</a>.</li> </ul>
8	Designed for polystyrene	(PS)
9	Cover glass thickness (mm)	e.g. 1.0

### 3.2.10.1 LD Objectives

When working with inverted microscopes, vessels are common whose bottom thickness deviates significantly from the usual cover glass thickness of 0.17 mm.

Normally, working distances (WD) of objectives with low magnification can bridge these distances without any problem:

- LD A-Plan 5x/0.15 M27 (FWD=11.7mm at CG=1mm polystyrene)
- or
- LD A-Plan 10x/0.25 M27 (FWD=8.5mm at CG=1mm polystyrene)

However, in the mid-range magnification area these working distances shrink usually to values around or below 1 mm. Such objectives cannot be used for thicker vessel bottoms.

To remedy this deficiency, special LD objectives can be used. They have a relatively large working distance and at the same time the usual parfocal distance of 45 mm of all other objectives.

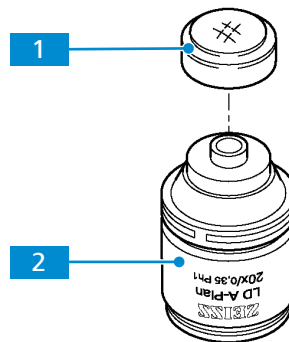


Fig. 26: LD objective

**1** Coverglass cap

**2** LD objective

More detailed information on LD objectives can be found at <https://www.micro-shop.zeiss.com/de/de/shop/objectives> or ask your ZEISS Sales & Service Partner.

### 3.2.10.2 Corr Objectives

It is important to know the exact thickness of the cover glass in order to obtain an excellent image.

A correction collar of corr objectives allows to compensate different thickness of cover glass.

To do this, select an area of the sample, and find the correction collar position which produces the optimum focus and image contrast (refocusing will always be necessary).

#### Info

##### Risk of collision

The sample plane must be no more than 2.5 mm above the stage plane to prevent the LD corr objective from hitting the lower part of the stage. It is possible to focus on the sample in the vessel with the bottom thickness of 1 mm with the help of object guide and mounting frame which fix the vessel on the stage. Under this condition all objectives can be swivelled through the travel range on the sample stage without collisions.

- ▶ Ensure that the sample plane is no more than 2.5 mm above the stage plane.

### 3.2.10.3 Immersion Objectives

With immersion objectives, the air between the cover glass and the objective is replaced with immersion oil.

Place a small, bubble-free drop of Immersol 518 N® (for transmitted light applications) or 518 F® (for fluorescence) on the front lens of the objective. Place the culture vessel or sample with the cover glass pointing towards the objective onto the sample stage or into the mounting frame.

Then carefully approach the objective to focus on the sample.

After each experiment, remove the immersion oil from the objective front lens with a soft cloth (possibly with petrolether).

Cleaning instructions can be found in the brochure "The Clean Microscope".

#### Info

Excessive quantities of immersion oil can get into the mechanical components of inverted microscopes and reduce their functionality.

### 3.2.11 Condensers

The present section applies to the following microscope types:

- Axiovert 5 TL
- Axiovert 5 TL SCB
- Axiovert 5 TL FL SCB
- Axiovert 5 RL TL SCB
- Axiovert 7 RL TL

The carrier for transmitted light illumination is equipped with a quick action locking mechanism for condenser exchange. The condenser can be installed in four different positions, each of them offset by 90 degrees.

To enlarge the sample space, the condenser can be moved backwards in its holder, towards the carrier for transmitted light illumination.

The condenser is suitable for various microscopy and contrast techniques as shown in the table below.

Transmitted light contrast techniques	LD Condenser 0.3 for Slider	LD Condenser 0.4 for Slider	LD Condenser 0.4 H Ph PlasDIC DIC iHMC	LD Condenser 0.55 H Ph PlasDIC DIC
Brightfield	●	●	●	●
Phase contrast	○	○	○	○
PlasDIC	○	○	○	○
DIC	-	-	○	○
iHMC	-	-	○	-
Pol contrast	○	○	○	-

● included

○ optionally available

- not available/not possible

### 3.2.11.1 LD Condenser 0.3 for Slider

**Purpose** Condensers are used to optimize the transmitted light illumination. The condenser is usable for brightfield, PlasDIC, polarization, and phase contrast applications.

**Position** The condenser is mounted on the carrier for transmitted light illumination.

The following features and controls are available:

- rotatable in its mount in 90° steps
- adjustable aperture diaphragm
- suitability for contrast techniques depends on the type of the slider
- suitable for the following sliders:
  - sliders 10x46 mm with fixed phase stop PH 1 [▶ 155]
  - slider 10x46 mm Ph/PlasDIC, H, Ph/PlasDIC [▶ 154]
- sliders can be inserted from the right or left

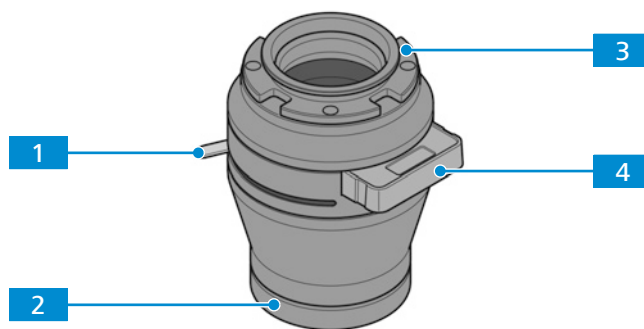


Fig. 27: LD condenser 0.3 for slider

- |                                                          |                                                          |
|----------------------------------------------------------|----------------------------------------------------------|
| <p><b>1</b> Lever for setting the aperture diaphragm</p> | <p><b>2</b> Front lens</p>                               |
| <p><b>3</b> Bayonet mount</p>                            | <p><b>4</b> Slider for different contrast techniques</p> |

### 3.2.11.2 LD Condenser 0.4 for Slider

**Purpose** Condensers are used to optimize the transmitted light illumination. The condenser is usable for brightfield, phase contrast, and PlasDIC applications.

**Position** The condenser is mounted on the carrier for transmitted light illumination.

The following features and controls are available:

- rotatable in its mount in 90° steps
- adjustable aperture diaphragm
- suitability for contrast techniques depends on the type of the slider
- suitable for the following sliders:
  - sliders 10x46 mm with fixed phase stop Ph 1 [▶ 155]
  - slider 10x46 mm Ph/PlasDIC, H, Ph/PlasDIC [▶ 154]
- sliders can be inserted from the right or left

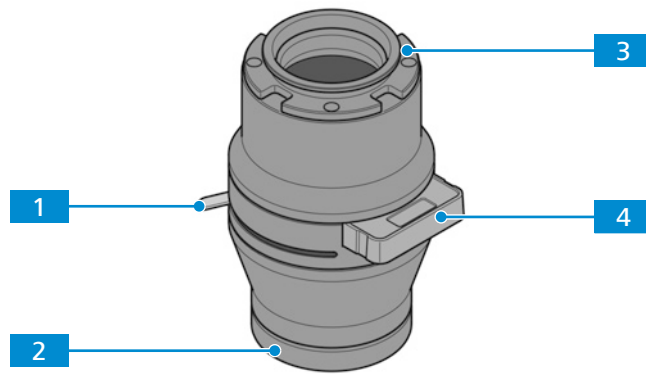


Fig. 28: LD condenser 0.4 for slider

- |          |                                          |          |                                          |
|----------|------------------------------------------|----------|------------------------------------------|
| <b>1</b> | Lever for setting the aperture diaphragm | <b>2</b> | Front lens                               |
| <b>3</b> | Bayonet mount                            | <b>4</b> | Slider for different contrast techniques |

### 3.2.11.3 LD Condenser 0.4 for H Ph PlasDIC DIC iHMC

**Purpose** Condensers are used to optimize the transmitted light illumination. The condenser is usable for brightfield, phase contrast, PlasDIC, DIC, and iHMC applications.

**Position** The condenser is mounted on the carrier for transmitted light illumination.

The following features and controls are available:

- rotatable in its mount in 90° steps
- adjustable aperture diaphragm for *brightfield* [[▶ 90](#)]
- five-position modulator disk and slot for *polarizer slider* [[▶ 155](#)]
- suitability for contrast techniques depends on the phase stop, slit diaphragms, and condenser modules

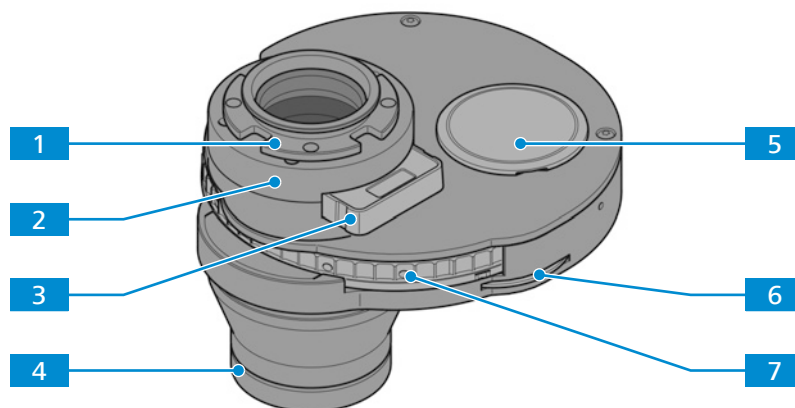


Fig. 29: LD Condenser 0.4 for H Ph PlasDIC DIC iHMC

- |          |                                                         |          |                                                                         |
|----------|---------------------------------------------------------|----------|-------------------------------------------------------------------------|
| <b>1</b> | Bayonet mount                                           | <b>2</b> | Spaces for stickers showing the designation of the installed components |
| <b>3</b> | Slider mount for polarizer slider                       | <b>4</b> | Front lens                                                              |
| <b>5</b> | Mounting hole for phase stops and contrast modules      | <b>6</b> | Wheel for setting the aperture diaphragm                                |
| <b>7</b> | Knurled wheel for adjusting the modulator disk position |          |                                                                         |

### 3.2.11.4 LD Condenser 0.55 for H Ph PlasDIC DIC

**Purpose** Condensers are used to optimize the transmitted light illumination. The condenser is usable for brightfield, phase contrast, PlasDIC, and DIC applications.

**Position** The condenser is mounted on the carrier for transmitted light illumination.

The following features and controls are available:

- rotatable in its mount in 90° steps
- adjustable aperture diaphragm for *brightfield* [▶ 90]
- five-position modulator disk
- height adjustment to focus / adapt illumination; height adjustment lift: approx. 9 mm
- suitability for contrast techniques depends on the phase stop, slit diaphragms, and condenser modules

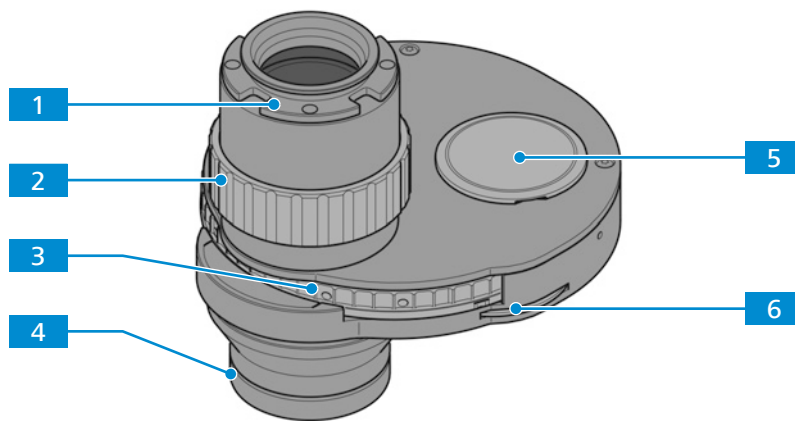


Fig. 30: LD Condenser 0.55 for H Ph PlasDIC DIC

- |                                                                  |                                                          |
|------------------------------------------------------------------|----------------------------------------------------------|
| <b>1</b> Bayonet mount                                           | <b>2</b> Knurled ring for adjusting the working distance |
| <b>3</b> Knurled wheel for adjusting the modulator disk position | <b>4</b> Front lens                                      |
| <b>5</b> Mounting hole for phase stops and contrast modules      | <b>6</b> Wheel for setting the aperture diaphragm        |

### 3.2.12 Stages

#### 3.2.12.1 Specimen Stage 232x230

**Purpose** Mechanical stages are used for fixing and positioning the sample for examination.

**Position** The mechanical stages are mounted directly onto the stand.

**Function** The sample is positioned in the beam path by means of a coaxial drive in X and Y direction. The adjustment range can be read off the respective vernier scale.

After installing the object guide to the specimen stage, the following components can be installed additionally to fix the samples:

- mounting frame Flex M
- mounting frame M
- mounting frame inserts for Petridishes
- mounting frame inserts for slides and chambers

The following features and controls are available after attaching the object guide:

- dimension 232x230 mm
- travel range 130x85 mm
- coaxial drive for X and Y adjustment

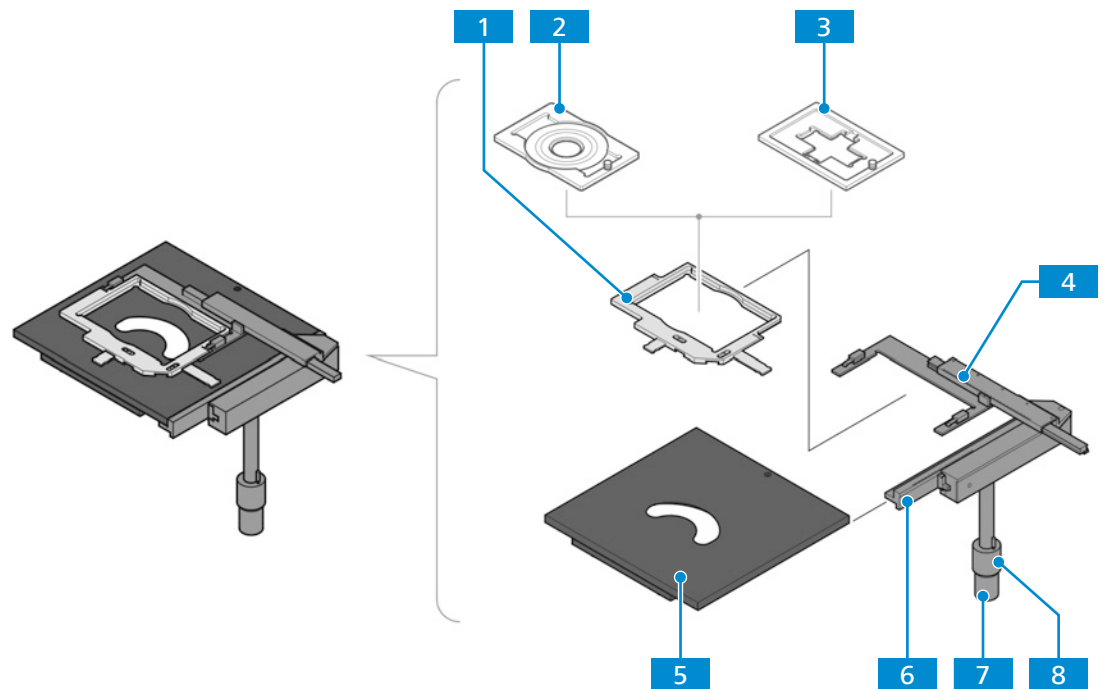


Fig. 31: Specimen stage 232x230 and object guide M 130x85 mm

- |                                                            |                                                                        |
|------------------------------------------------------------|------------------------------------------------------------------------|
| <b>1</b> Mounting frame Flex M                             | <b>2</b> Mounting frame insert Flex M, petridishes                     |
| <b>3</b> Mounting frame insert Flex M, slides and chambers | <b>4</b> Vernier scales for display of the adjustment range in X and Y |
| <b>5</b> Specimen stage 232x230                            | <b>6</b> Object guide M 130x85 mm R/L                                  |
| <b>7</b> Coaxial drive; knurled knob for X adjustment      | <b>8</b> Coaxial drive; knurled knob for Y adjustment                  |

### 3.2.12.2 Mechanical Stage 130x85 R/L

**Purpose** Mechanical stage designed to hold and position samples in mounting frames K.

**Position** The mechanical stages are mounted directly onto the stand.

**Function** The sample is fixed on the stage by means of the universal mounting frame K or other mounting frames K.

The sample is positioned in the beam path by means of a coaxial drive in X and Y direction. The adjustment range can be read off the respective vernier scale.

The following features and controls are available:

- The mechanical stage with coaxial drive can be fitted on the right-hand or left-hand side of the stand.
- coaxial drive for X and Y adjustment
- travel range 130x85 mm
- mounting frames K (frame size 160x110 mm) can be inserted

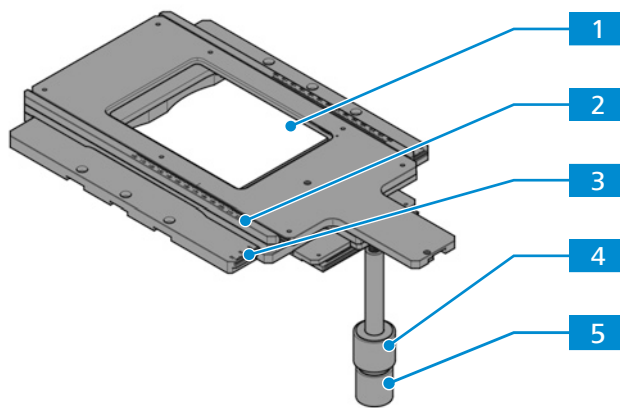


Fig. 32: Mechanical stage, 130x85 R/L

- |                                                                        |                                                                        |
|------------------------------------------------------------------------|------------------------------------------------------------------------|
| <p><b>1</b> Opening for mounting frames K (frame size 160x110 mm)</p>  | <p><b>2</b> Vernier scale for display of the adjustment range in X</p> |
| <p><b>3</b> Vernier scale for display of the adjustment range in Y</p> | <p><b>4</b> Coaxial drive; knurled knob for Y adjustment</p>           |
| <p><b>5</b> Coaxial drive; knurled knob for X adjustment</p>           |                                                                        |



### 3.2.12.3 Mechanical Stage 40x40 R/L, Reflected Light

**Purpose** Mechanical stages are used for fixing and positioning the sample for examination on stage inserts.

**Position** The mechanical stages are mounted directly onto the stand.

**Function** The sample is fixed on the stage insert by means of clamping springs.

The sample is positioned in the beam path by means of a coaxial drive in X and Y direction.

The following features and controls are available:

- The mechanical stage with coaxial drive can be fitted on the right-hand or left-hand side of the stand.
- coaxial drive for X and Y adjustment
- travel range 40x40 mm
- suitable for use with D = 115 mm stage inserts

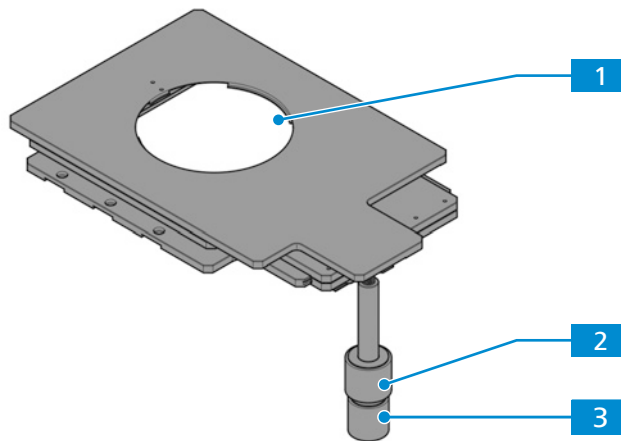


Fig. 33: Mechanical stage 40x40 R/L, reflected light

- |                                                                                                                     |                                                              |
|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| <p><b>1</b> Opening for stage inserts (D = 115 mm)</p> <p><b>3</b> Coaxial drive; knurled knob for X adjustment</p> | <p><b>2</b> Coaxial drive; knurled knob for Y adjustment</p> |
|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|

### 3.2.12.4 Scanning Stage 130x85 mot P; CAN

#### Info

For additional information and detailed descriptions, refer to further applicable documents or ask your ZEISS Sales & Service Partner.

**Purpose** The motorized scanning stages are designed for applications where high accuracy and repeatability is required. They are used for manual or automatic positioning of samples.

**Position** The scanning stage is mounted directly onto the stand.

**Function** The stage is connected to a user PC via CAN-USB converter. The stage is controlled via the ZEN software.

The sample is fixed on the stage by means of the mounting frames K. The sample is positioned in the beam path manually by means of a joystick, trackball, or via the ZEN software. The position of the sample can be read out via ZEN.

The following features and control units are available:

- joystick
- trackball
- electronic coaxial drive; CAN

- travel range 130x85 mm
- mounting frames K (frame size 160x110 mm) can be inserted into the opening

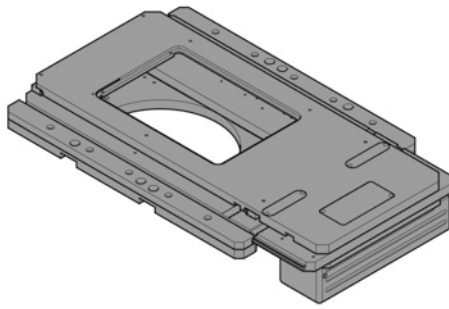


Fig. 34: Scanning Stage 130x85 mot P; CAN

### 3.2.13 Smart Control Box

The present section applies to the following microscope types:

- Axiovert 5 TL SCB
- Axiovert 5 TL FL SCB
- Axiovert 5 RL SCB
- Axiovert 5 RL TL SCB

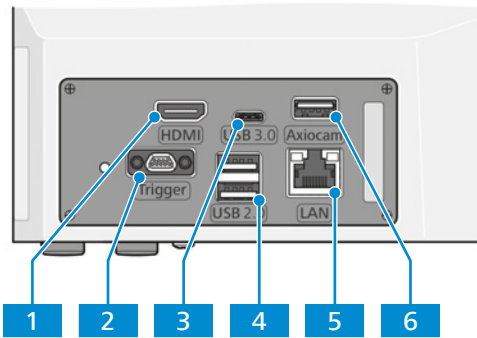


Fig. 35: Smart Control Box

- |                         |                               |
|-------------------------|-------------------------------|
| <b>1</b> HDMI port      | <b>2</b> Micro D port         |
| <b>3</b> USB 3.0 type C | <b>4</b> USB 2.0 type A ports |
| <b>5</b> Ethernet port  | <b>6</b> USB 3.0 type A port  |

**Purpose** The Smart Control Box is used for stand-alone operation (without PC) of microscope stand functions with ZEISS Axiocam (202, 208, 305) via On Screen Display (OSD) and for operation with Labscope (Windows and Apple® iOS®). Automatic functions for camera control, image enhancement functions and for reading out encrypted microscope functions are also available via the Smart Control Box.

For more information on available operating modes, see *Operating Modes* [▶ 57].

#### Info

Further information on the software and its operation is available in the software’s online help.

### 3.2.14 6-Position Reflector Turret, Encoded for P&C Modules

**Purpose** The reflector turret is used to hold the push-and-click (P&C) reflector modules and to swivel the desired reflector module into the beam path.

**Position** The reflector turret is fixed to the stand below the nosepiece.

**Function** Rapid reflector change by rotating the reflector turret wheel. The activated reflector is marked by a line on the right of the reflector turret cover.

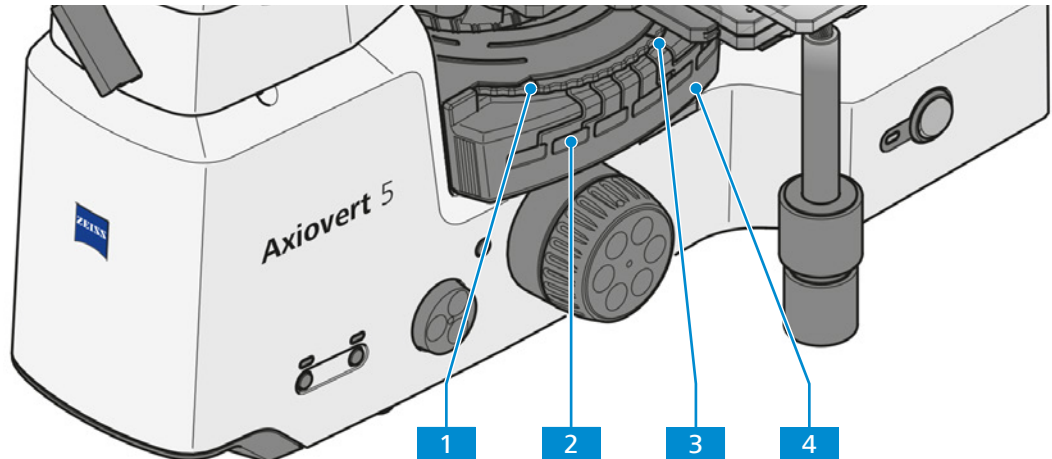


Fig. 36: 6-position reflector turret, encoded

**1** Reflector turret wheel

**2** Labelling area

**3** Marking line

**4** Protective cover

## 3.3 Light Manager Function

Only the following light sources support the Light Manager function:

- RL light source: LED 10W
- TL light source: LED 10W
- FL light source: Colibri 3

The Light Manager function saves the values of the set light intensities between different combinations of objective and reflector turret positions for a given light source.

When changing the light intensity of one objective/reflector combination, the light intensities of other combinations will also change according to the set values.

The optimal intensity value for a given light path combination is not changed unless the user defines a new optimal intensity value for the same light path combination.

This ensures that users do not have to repeatedly set light intensities for each objective/reflector combination when switching between samples that require different illumination intensities.

After restarting the microscope, all stored optimal light intensity values can be restored.

### 3.4 ECO Mode

The ECO mode function should be used for short-time use of the microscope. This function saves energy and extends the service life of the light sources.

After 15 minutes without operations the light source is switched off. The firmware remembers the last intensity of the light source before it was switched off by the ECO mode function.

The light source can be switched on by one of the following actions:

- rotating the nosepiece
- rotating the reflector turret
- switching the **ECO/Permanent** mode switch
- pressing the **TL** button
- pressing the **RL** button
- pressing or rotating the **Intensity/LM** knob
- pressing the **Snap** button
- if applicable:
  - using the **Focus** knob to move the z motor
  - switching the FL channel of the Colibri 3 light source
  - receiving a message from the user PC or the tablet

### 3.5 Microscopy and Contrast Techniques

The availability of microscopy and contrast techniques depends on the microscope type and the configuration.

#### 3.5.1 Transmitted Light Brightfield Microscopy

Transmitted light (TL) brightfield microscopy is the most common of all optical microscopy methods, since it can be used to quickly and easily examine high-contrast or stained samples (e.g. blood smears).

In order to obtain an image as close as possible to the object, not only the so-called direct beam bundles but also the indirect ones, i.e. the beam bundles diffracted and scattered at the preparation details, are of essential importance. According to ABBE, the larger the indirect beam components are, the more true to the object the microscopic image is.

#### 3.5.2 Transmitted Light Phase Contrast Microscopy

The phase contrast method is ideal for examining thin uncolored samples, e.g. individual cells of cell cultures. Generally, the human eye cannot detect phase differences (variations in refractive index or thickness) within the different cell components.

The phase contrast method uses the optical modulators "annular phase diaphragm" and "phase ring" to convert the small phase differences in intensity differences which are visible to the human eye. The interference of different beams in the intermediate image is important for the generation of such images.

With the aid of the optically defined ring channel "annular phase diaphragm and phase ring", the bright direct light portions are attenuated and provided with a constant phase shift. The indirect light portions, however, which are diffracted by different cell particles, bypass this optical channel and their phase is affected by the difference in the sample's refractive index and thickness.

In the intermediate image plane, the partial beams are thus differently affected and achieve interference and strengthen or weaken each other (constructive and destructive interference) – depending on their phase. As a result, these interferences create image contents with intensity differences visible to the human eye.

### 3.5.3 Transmitted Light Differential Interference Contrast Microscopy

The transmitted light DIC method allows for a high-contrast vivid display of transparent sample details.

The light is linearly polarized by a polarizer and is separated into two beams in a birefringent prism. These pass through two neighboring sample locations at a short distance and experience different path differences there due to differences in refractive index and sample thickness. Both beams are then combined in a second birefringent prism and have the same polarization after passing the analyzer. Therefore both beams can interfere in the intermediate image and the path differences are thus converted into intensity differences represented by a gray scale. A compensator, e.g.  $\lambda$ -plate, may be used for a consecutive conversion of the gray scale in a color scale.

### 3.5.4 Transmitted Light PlasDIC Microscopy

PlasDIC can be used independently from the material of the sample holder.

The contrast method gives a relief-like image and is especially well suited for thicker objects. The contrast is adjustable. It is possible to contrast the cavities of microtiter plates up to the edge. It is not necessary to use cultivation holders with a glass base.

### 3.5.5 Transmitted Light iHMC

iHMC (improved Hoffman modulation contrast) is an optimized version of the HMC contrast technique.

It produces a relief image of the sample.

### 3.5.6 Transmitted Light Polarization

The transmitted light polarization method is used for samples which change the polarization of the light. Such samples are called birefringent. Examples include crystals, minerals or polymers. If such birefringent substances are observed between crossed polarizers, the birefringent portion of the sample appears bright while its surroundings remain dark.

### 3.5.7 Reflected Light Brightfield Microscopy Using the KÖHLER Method

Reflected light brightfield microscopy is the easiest and most commonly used RL-microscopy method. It is used to examine optically opaque samples or samples as e.g. cut, polished, etched metal or ores.

In order to obtain an image as close as possible to the object, not only the so-called direct beam bundles but also the indirect ones, i.e. the beam bundles diffracted and scattered at the preparation details, are of essential importance. According to ABBE, the larger the indirect beam components are, the more true to the object the microscopic image is.

The cone of light emerging from the reflected light light source is reflected on a color-neutral beam splitter before it passes through the objective which is focused on the sample surface (so-called condenser function). The objective collects the light reflected on the sample and creates, with the tube lens, the microscopic intermediate image. This image can then be examined visually or documented using a camera.

### 3.5.8 Reflected Light Darkfield Microscopy Using the KÖHLER Method

The reflected light darkfield method is applied when samples are examined, which do not have areas with different reflectivity (ideal brightfield samples), but which show deflections (as scratches, cracks, dust particles etc.) on the plane surface. All such light-scattering details appear bright in the darkfield, while the reflective plane areas remain dark.

### 3.5.9 Reflected Light DIC and C-DIC Microscopy

The reflected light DIC and the reflected light C-DIC methods (DIC = Differential Interference Contrast; C-DIC = Circular polarized light–differential interference contrast) are used for the high-contrast imaging of small height differences on the surface of opaque samples.

C–DIC is a polarization–optical differential interference contrast method where, unlike conventional DIC according to Nomarski, the DIC prism is arranged in circular, not linear, polarized light. Consequently, the interference contrast generated is invariant in relation to the oscillation orientation of the DIC prism, and so the latter can be rotated directionally in accordance with the characteristics of the object. This means that the stage does not need to be rotated while the relationship with the object is preserved. For the user, this means more information and an increase in sample throughput.

### 3.5.10 Reflected Light Polarization Microscopy

Reflected light polarization is a contrasting method suited for cut, polished surfaces of mineral ore, coal, ceramics, special metals and alloys. Depending on the orientation of the crystals and the sample details, the cut surfaces often react differently when reflected in linearly polarized light.

The illumination light is polarized by the polarizer before passing through the objective onto the sample surface where it is reflected. Then the beam parts experience path differences depending on the structure and polarization of optical rotations which, when passing through the analyzer, are represented by different shades of gray. With the aid of a compensator with a  $\lambda$ -plate the gray contrast can be converted into a color contrast.

Even when examining "dark" sample surfaces, a rotatable  $\lambda/4$  plate in front of the objective (anti-reflective cap) helps eliminate the reflections which are inevitable when working with objectives with very low magnification.

A sample is bireflectant when the sample details show differences in brightness and color which change when the direction of vibration of the polarizer or the stage is rotated. For samples with low bireflectance using the analyzer with a rotatable lambda plate is recommended.

### 3.5.11 Reflected Light Fluorescence Microscopy

The reflected light fluorescence method is used to show fluorescent substances in typical fluorescent colors in high contrast. The light originating from a high-performance light source in a reflected light fluorescence microscope passes through a heat protection filter onto an excitation filter (bandpass). The filtered short-wave excitation radiation is reflected by a Dichroic Beam splitter and is focused on the sample through the objective. The sample absorbs the short-wave radiation before emitting longer-wave fluorescence radiation (Stokes' Law). This radiation is then captured from the image side by the objective and passes through the Dichroic Beam splitter. Last, the beams pass through an emission filter (longpass/bandpass) and only the long-wave radiation emitted by the sample passes.

The spectra of the excitation and the emission filter must match very closely. They must be inserted in a Reflector Module FL EC P&C reflector module together with the according Dichroic Beam splitter.

### 3.5.12 Reflected Light TIC Microscopy

The reflected light TIC method (Micro-interferometry; TIC = Total Interference Contrast in the circular polarized light) is used in imaging and measuring sample structures that exist in different azimuths.

#### Evaluation of the measured values

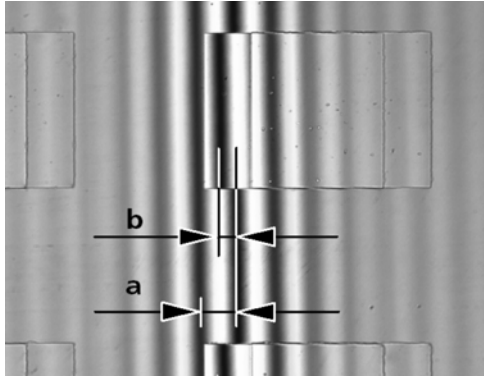


Fig. 37: Interference stripes

The values **a** (distance between interference stripes) and **b** (offset of the interference stripes along the step) are determined with the aid of an eyepiece reticle micrometer or with a micrometer eyepiece.

If working with white light (without an interference filter), set  $\lambda = 550$  nm. When interference filters are used, it is important to apply the focal point of their wave lengths.

The measured path difference depends on the aperture and increases with the illumination aperture.

The step height  $SH$  is determined with the following formula:

$$SH = \frac{n\Delta}{2} = \frac{\lambda b}{2a}$$

Where

$SH$  = step height in nm

$n$  = refractive index of the environment, mostly air ( $n = 1$ )

$\Delta$  = phase difference

$a$  = distance between interference stripes

$b$  = offset of the interference stripes along the step

$\lambda$  = wave length of the illumination in nm

The following correction values must be considered depending on the objective used:

Objective	Correction factor k
5x/0.15	1.0057
10x/0.25	1.0161
10x/0.30	1.0236
20x/0.4	1.0436
20x/0.50 and 50x/0.75	1.0718
50x/0.60	1.1111
50x/0.75 and 100x/0.75	1.2038
50x/0.80	1.2500
50x/0.90 and 100x/0.90	1.3929
100x/0.95	1.5241

Tab. 1: Correction depending on aperture

**Example**

$a = 11 \text{ mm}$ ;  $b = 5 \text{ mm}$ ;  $\lambda = 550 \text{ nm}$ ; objective 20x/0.50

$$SH = \frac{\lambda \cdot b \cdot k}{2a} = \frac{550 \text{ nm} \cdot 5 \text{ mm} \cdot 1.0718}{22 \text{ mm}} = 134 \text{ nm}$$

Attention:

- If the step and its surroundings are made from different materials, the phase jumps characteristic for the material must be considered. For all non-conducting materials, the phase jump is  $180^\circ$ , and for all semi-conductors only slightly different from  $180^\circ$ . Consequently, errors in the step-height determination may be neglected. However, if metals on top of glass are investigated, the results may become erroneous. The phase jumps given in table 2 were calculated for vertical light incidence and compact materials. They can serve as approximate values, since the phase jumps depend on the layer thickness and the angle of incidence of the light. An accurate determination of the layer thickness is possible only when the complete sample is covered with a homogeneous layer and the path differences are measured.
- If the layers and the steps are transparent, as with silicon dioxide on silicon, for example, the interference stripes can change their colors, so that the determination of the order of the interference may become problematic. This complication can be avoided if the sample is covered with a homogeneous layer.

Material	Phase jump $\Phi$
Copper	140.0°
Gold	142.5°
Silver	151.0°
Bismuth	151.0°
Nickel	157.0°
Iron	157.5°
Zinc	159.0°
Platinum	160.0°
Aluminum	160.0°
Tin	160.5°
Chrome	165.0°
Coal	160.0°
Graphite	165.0°
Silicon	177.0°
Glass	180.0°

Tab. 2: Calculated phase jumps for compact material and vertical incidence of light

For a thickness measurement (step height), half the difference of the phase jump at the respective interface must be considered:

$$SH = \frac{\Delta}{2} - \frac{\delta\phi}{2}$$



**Example: extreme case of copper on glass**

$$\Phi_{\text{copper}} = 140^\circ, \Phi_{\text{glass}} = 180^\circ,$$

consequently, for the additional thickness due to the phase jump we obtain

$$\frac{\delta\phi}{2} = 20^\circ$$

or

$$\frac{\lambda}{18} = 30 \text{ nm}$$

Without consideration of the phase jump at the respective interfaces, the thickness value would be too large by 30 nm.

## 3.6 Operating Modes

### 3.6.1 Stand-Alone Operation (without PC) via On Screen Display

The present section applies to the following microscope types:

- Axiovert 5 TL SCB
- Axiovert 5 TL FL SCB
- Axiovert 5 RL SCB
- Axiovert 5 RL TL SCB

#### Info

**It is not intended to either directly or indirectly generate medical diagnostic results.**

- ▶ Do not generate medical diagnostic results when using the camera.

**Purpose** With the Smart Control Box, using the on-screen display (OSD), the sample can easily be observed to snap images or create videos without an additional user PC.

**Function** The microscope with AxioCam 202, AxioCam 208, or AxioCam 305 can be used together with the Smart Control Box (SCB) in stand-alone mode. The SCB acts as the control interface between microscope, AxioCam, Keyboard, Mouse, and Monitor. A USB Type-C drive is included in the stand package and can be inserted into the USB 3.0 slot type C on the SCB for storing data. Then images are recorded and saved on the USB drive. Functions of the microscope stand such as the Light Manager and encoding are automatically launched. The SCB is equipped with image enhancement functions such as true color and noise reduction.

Functionality of the microscope:

- *Light Manager* [▶ 51]
- OSD menu
- Coded components
- Image enhancement (true color, noise reduction)
- Record and save images on the USB drive
- Record and save videos on the USB drive

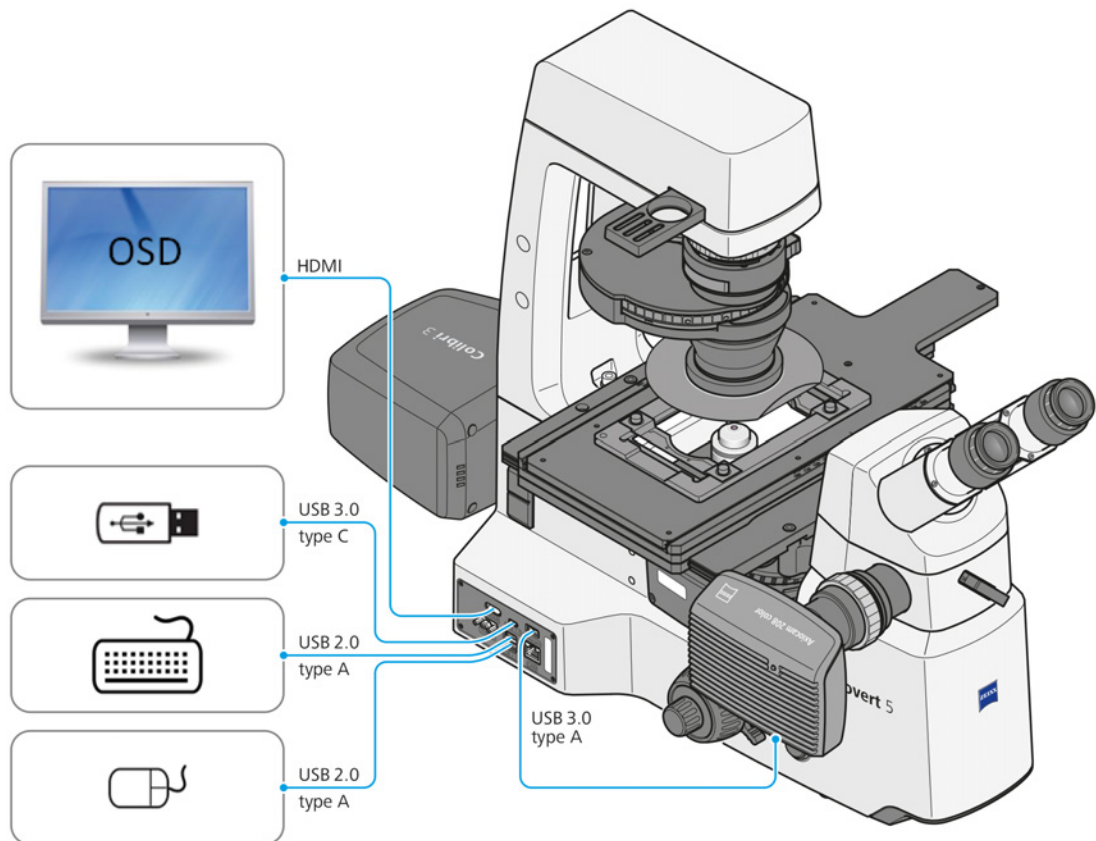


Fig. 38: Axiovert 5 in stand-alone operation

The following accessories are required for the stand-alone operation:

- monitor
- HDMI cable
- keyboard
- mouse
- USB stick type C storage

For wireless operation, an additional Wifi dongle is required.

For more information on the OSD menu see *Operating the Microscope via the On Screen Display (OSD) Menu* [▶ 115].

### 3.6.2 Operation via Labscope

The present section applies to the following microscope types:

- Axiovert 5 TL SCB
- Axiovert 5 TL FL SCB
- Axiovert 5 RL SCB
- Axiovert 5 RL TL SCB

#### Info

**It is not intended to either directly or indirectly generate medical diagnostic results.**

- ▶ Do not generate medical diagnostic results when using the software.

### 3.6.2.1 Smart Control Box Connected to Labscope via an Ethernet Connection

**Function** This working mode provides more stable and faster image transfer between Labscope and the Smart Control Box than the wireless mode via Wi-Fi. Live images and hardware control commands are transferred via ethernet connection between PC and Smart Control Box. Snapped images or recorded videos are stored in Labscope.

The control interface can be a PC or portable electronic device.

Functionality of the microscope:

- Light Manager
- Coded components
- ECO mode
- Image enhancement
- Observe live images
- Record and save images via software
- Advanced features in Labscope

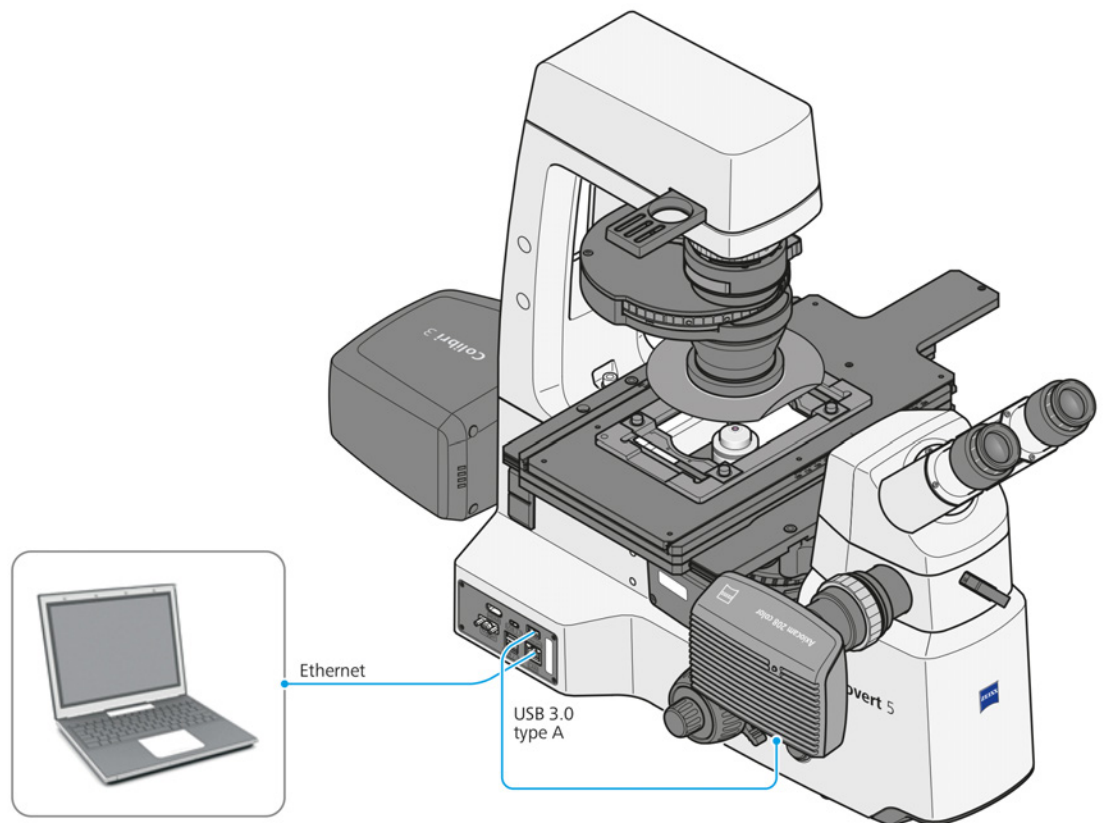


Fig. 39: Smart Control Box connected to Labscope via Ethernet

### 3.6.2.2 Wireless Control via Wi-Fi Dongle

#### Info

The microscopes are compatible with a USB Wi-Fi dongle. The Wi-Fi dongle must be ordered separately.

**Function** Live images and hardware control commands are transferred via Wi-Fi between PC and Smart Control Box. Snapped images or recorded videos are stored in the Labscope software.

The recommended USB Wi-Fi dongle is connected to a USB port of the Smart Control Box.

The control interface can be a PC or portable electronic device that uses Wi-Fi.

Functionality of the microscope:

- Light Manager
- Coded components
- ECO mode
- Image enhancement
- Observe live images
- Record and save images via software
- Advanced features in Labscope

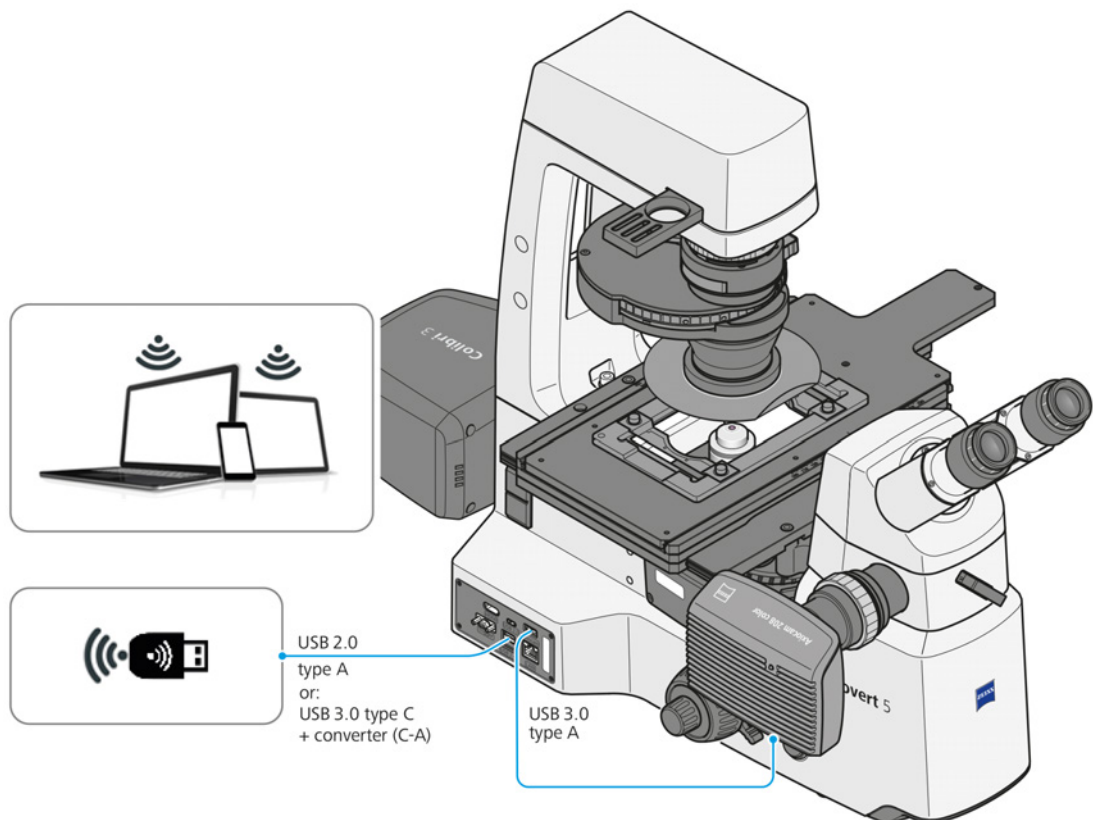


Fig. 40: Axiovert connected with Labscope software via a Wi-Fi dongle

### 3.6.3 Operation via ZEN on PC

#### NOTICE

##### **Excessive EMI noise due to redundant connection on the Smart Control Box**

The EMI performance might be degraded.

- ▶ Unplug the redundant connection from the Smart Control Box.

#### Info

**It is not intended to either directly or indirectly generate medical diagnostic results.**

- ▶ Do not generate medical diagnostic results when using the software.

**Function** This operating mode provides full software capability by using ZEN. The microscope hardware is controlled directly by the ZEN software. If applicable, the Smart Control Box is disabled after connecting the USB 2.0 type B cable to the stand. Hardware configuration is done by "MTBConfiguration.exe" that runs on the user PC.

The camera is powered by the user PC via the USB 3.0 type A cable. Image data is transferred to the user PC via the USB 3.0 cable connected to the camera.

Live images can also be viewed on the user PC and basic features in ZEN are available.

Functionality of the microscope:

- Light Manager
- Coded components
- ECO mode
- Image enhancement
- Observe live images
- Record and save images via software
- Basic features in ZEN
- Motorized z drive (only for Axiovert 7 RL and Axiovert 7 RL TL)

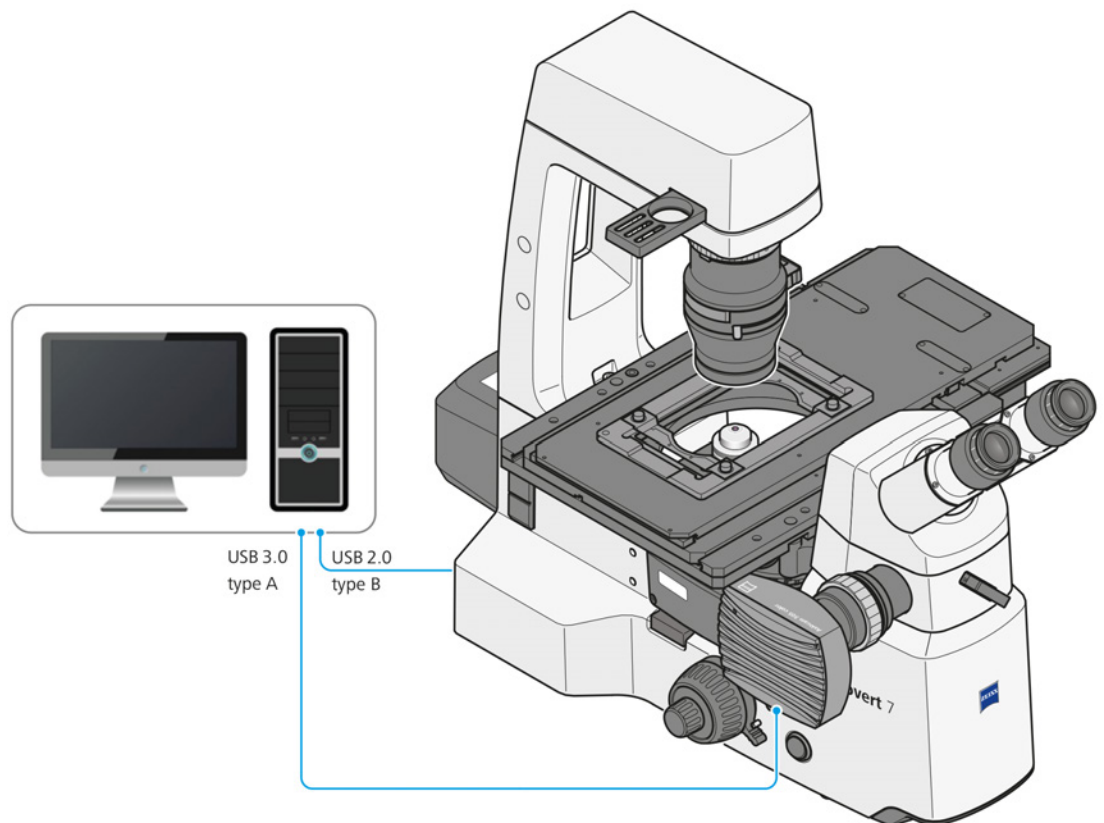


Fig. 41: Axiovert 5/7 connected with ZEN software via a USB

## 4 Installation

Perform only the installation work described in this document. All other installation work not described may only be carried out by an authorized ZEISS service representative.

### 4.1 Unpacking and Setting up the Microscope

- Procedure**
1. Open the packaging.
  2. Take the microscope, all assemblies, and accessories out of the packaging.
  3. Check them for completeness as per delivery note.
  4. Check all parts for damaging.
  5. Place the microscope on a vibration-free, level, and non-inflammable surface.


It is recommended to keep the original packing and store it away for later use, e.g. for stowing the microscope during periods of non-use or for returning the microscope to the manufacturer for repair.

### 4.2 Removing the Transportation Lock

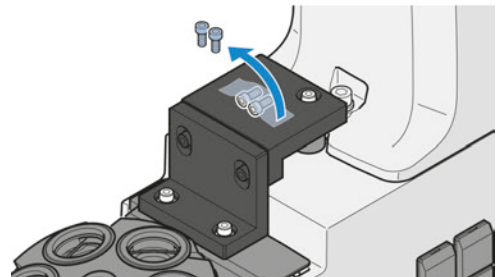
The present section applies to the following microscope types:

- Axiovert 7 RL
- Axiovert 7 RL TL

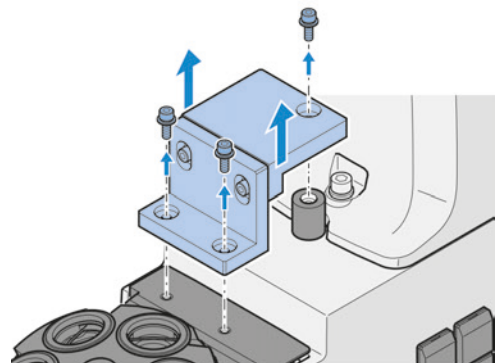
**Parts and Tools**  Hex Key, 3.0 mm

**Prerequisite**  The microscope is unpacked.

- Procedure**
1. Remove the two included screws, which are fixed to the transportation lock.

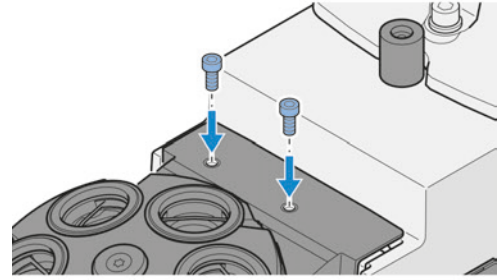


2. Remove the three screws.



3. Remove the transportation lock.

4. Screw the two included screws into the remaining holes.

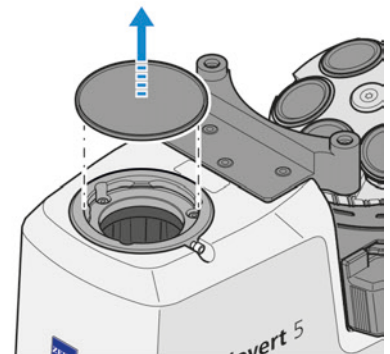


Proceed in the reverse order for installing.

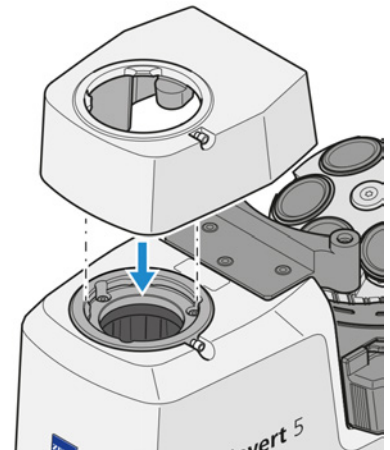
### 4.3 Assembling the Ergo Intermediate Piece

**Parts and Tools**  Hex Key, 3.0 mm

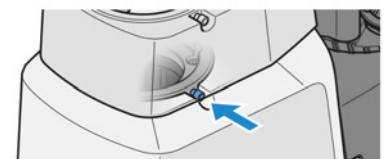
- Procedure**
1. Loosen the clamping screw.
  2. Remove the dust cap from the dovetail ring mount on the stand side.



3. Remove the dust cap from the underside of the ergo intermediate piece.
4. Insert at an angle.
5. Insert the intermediate piece with its dovetail ring into the stand mount.



6. Rotate the intermediate piece into the desired position.
7. Tighten the clamping screw.

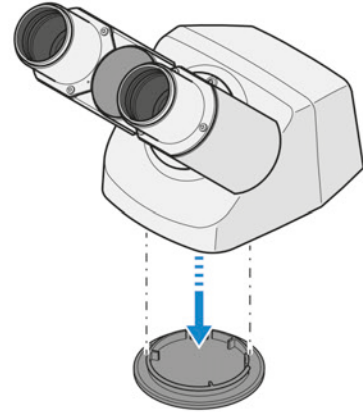


Proceed in the reverse order for removal.

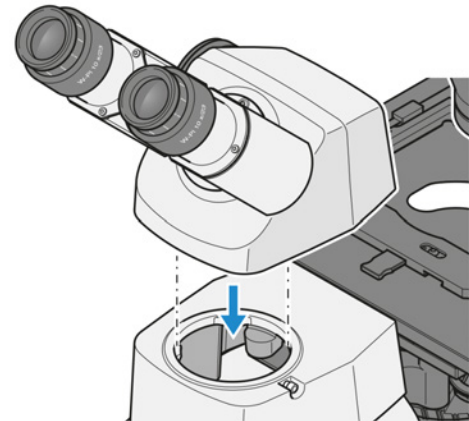
## 4.4 Assembling the Binocular Tube

**Parts and Tools** 🔑 Hex Key, 3.0 mm

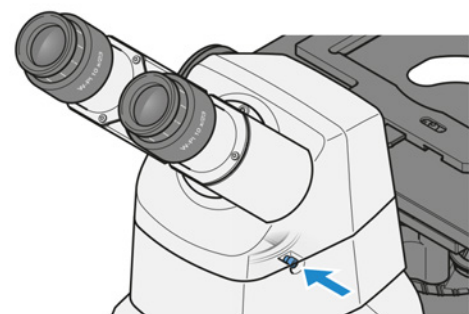
- Procedure**
1. Loosen the clamping screw.
  2. Remove the dust cap from the dovetail ring mount on the stand side.
  3. Remove the dust cap from the underside of the tube.



4. Hold the binocular tube at an angle, insert it with the dovetail ring into the ergo intermediate piece mount and turn it into a horizontal position.
5. Rotate the binocular tube into the desired observation position.



6. Tighten the clamping screw.



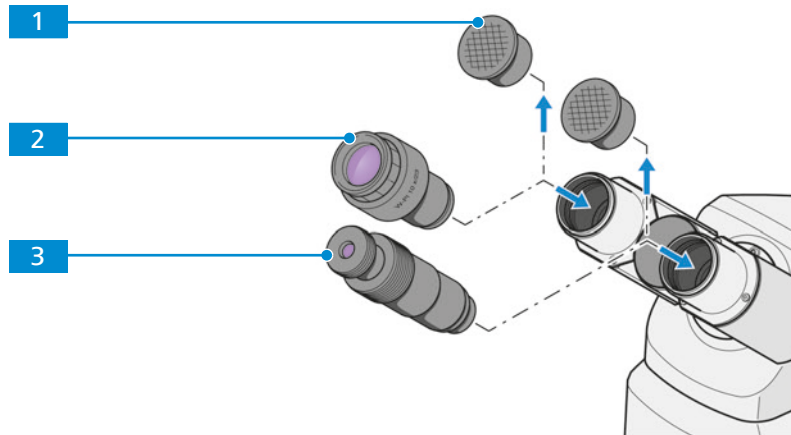
Proceed in the reverse order for removal.



## 4.5 Assembling Components into the Binocular Tube

The following components can be inserted into the binocular tube:

- eyepieces
- auxiliary microscope



**1** Dust cap

**2** Eyepiece

**3** Auxiliary microscope

- Procedure**
1. Remove both dust caps **1** from the binocular tube.
  2. Remove both eyepieces **2** from the box and insert them into the eyepiece socket of the binocular tube to the stop.
  3. Instead of an eyepiece insert an auxiliary microscope **3** in one eyepiece socket.
- Proceed in the reverse order for removal.

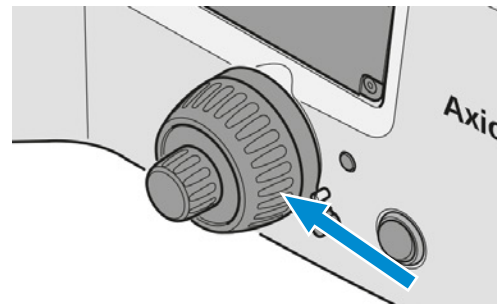
## 4.6 Assembling Objectives

### Info

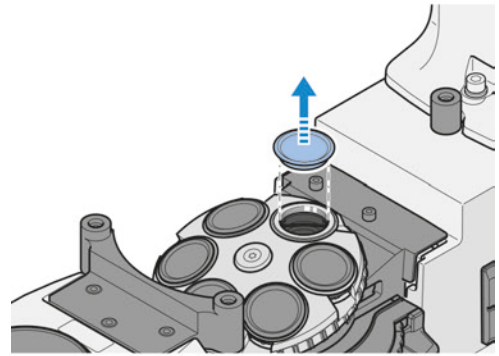
The objectives should be installed beginning from nosepiece position **1** in order of increasing magnification.

**Prerequisite** ✓ *No Aqua Stop is installed [▶ 150].*

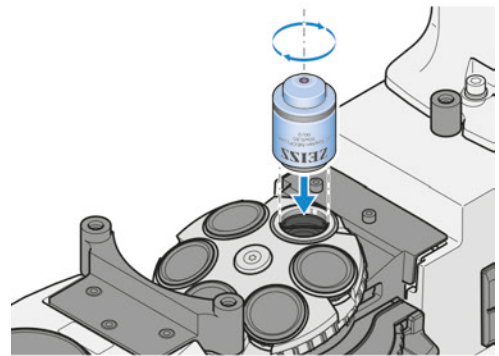
- Procedure**
1. Fully lower the nosepiece by turning the coarse focusing drive clockwise.



- Remove the cover cap from the nosepiece's relevant opening.



- Take the objective out of its case.
- Carefully screw the objective into the opening. Make sure it engages properly in the nosepiece's thread.



Proceed in the reverse order for removal.

## NOTICE

### Dust-sensitive components

If unused nosepiece openings remain uncovered, particles may enter the microscope and may damage its optics and mechanics permanently.

- ▶ Always close unused nosepiece openings with cover caps!

### 4.6.1 Assigning Objectives

## NOTICE

### Collision with the sample and/or the microscope stage due to incorrect objective assignment

The objective can collide with the sample or the stage and damage the device if the objectives are assigned to the wrong position.

- ▶ Assign the installed objectives to the corresponding position in the nosepiece.

The objectives can be assigned in different ways:


- Assign the objective types via OSD.
- Assign the objective types via Labscope.
- Assign the objective types via MTB for ZEN.

## Info

For additional information and detailed descriptions, refer to further applicable documents or ask your ZEISS Sales & Service Partner.

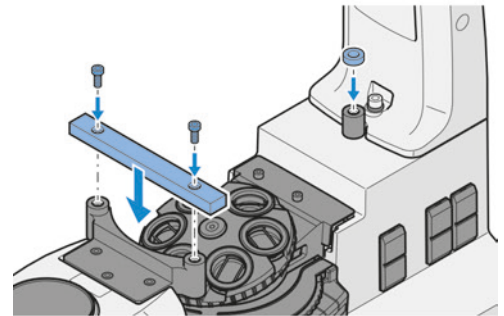
## 4.7 Assembling the Stage

### 4.7.1 Assembling the Specimen Stage 232x230

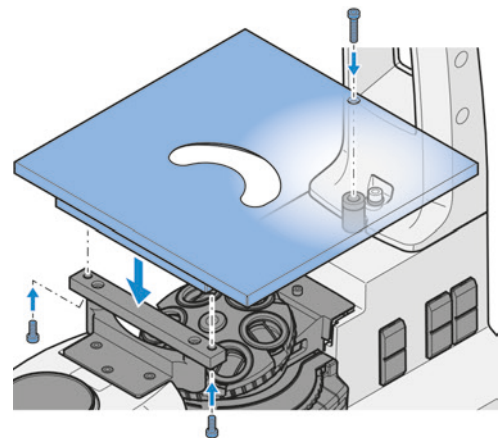
- Parts and Tools**
-  Spacer disk
  -  Spacer bar
  -  Hex Key, 3.0 mm

**Prerequisite** ✓ The nosepiece is in the lowest position.

- Procedure**
1. Set the spacer bar down on the stand's front part, so its recesses embrace the two elevated attachment points.
  2. Fix the spacer bar to the stand with two short screws.
  3. Place a spacer disk on the mounting hole in the stand's rear part.



4. Set down the stage on the stand, matching its mounting hole with the one in the stand's rear part.
5. From above, fix the stage to the stand's rear part with a screw.
6. From below, fix the stage to the spacer bar with a screw in each of the bar's two mounting holes.





Proceed in the reverse order for removal.

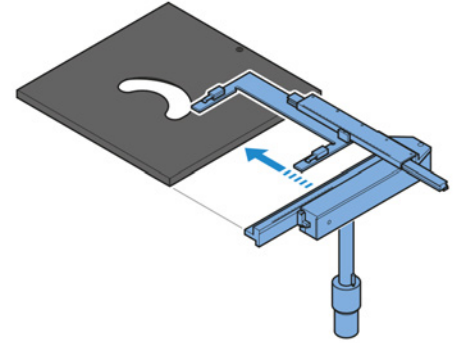
### 4.7.1.1 Assembling the Object Guide and Mounting Frame to the Stage

#### Info

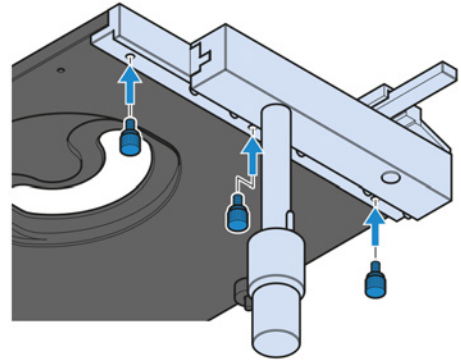
The object guide can be mounted to the right or to the left side of the stage.

- Parts and Tools**
-  Mounting frame Flex M
  -  Mounting frame insert Flex M

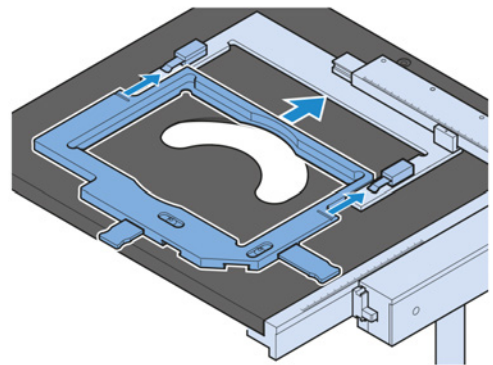
- Procedure**
1. Set the object guide onto the stage.



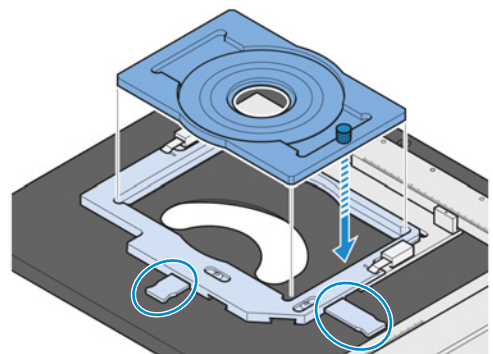
2. Tighten the three knurled screws to fix the object guide from below.



3. Slide the mounting frame into the object guide until it snaps into place.



4. If required, put a mounting frame insert onto the mounting frame and fix it with the sliders.



### 4.7.2 Assembling the Mechanical Stage 130x85 R/L

#### Info

Depending on your preferences, the stage can be mounted with the drive on the right- or the left-hand side.

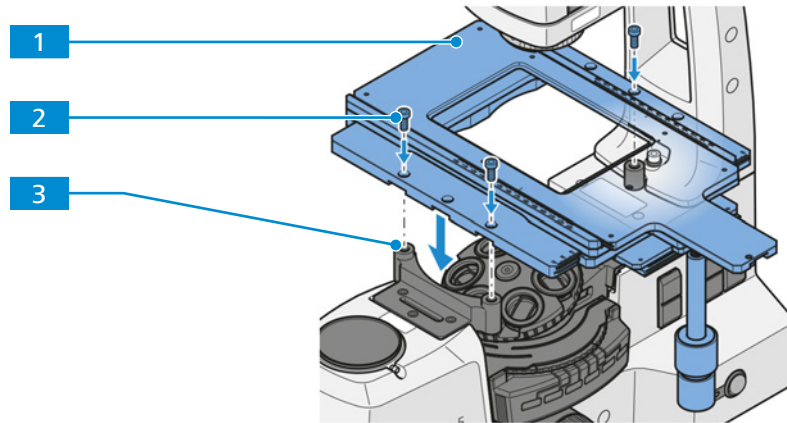


Fig. 42: Installing the mechanical stage 130x85 R/L

- |                             |                            |
|-----------------------------|----------------------------|
| <b>1</b> Mechanical stage   | <b>2</b> Fixing screw (3x) |
| <b>3</b> Mounting hole (3x) |                            |

**Parts and Tools**  Hex Key, 3.0 mm

**Prerequisite**  The nosepiece is in the lowest position.

- Procedure**
1. Take the stage and position it according to your preferences.
  2. Set down the stage **1** on the stand, matching its mounting holes to those of the stand **3**.
  3. Fix the stage to the stand with a screw **2** in each of the stage's three mounting holes.
  4. Continue with *Assembling the Mounting Frame K* [[▶ 69](#)].

Proceed in the reverse order for removal.

#### 4.7.2.1 Assembling the Mounting Frame K

**Prerequisite**  The stage is fixed to the stand.

- Procedure**
1. Place the mounting frame on the stage. Make sure its red-dotted corner matches the red-dotted corner of the stage.
  2. Diagonally press the mounting frame against the springs and into the stage's opening.
  3. Verify that the mounting frame is seated correctly.

Proceed in the reverse order for removal.

### 4.7.3 Assembling the Mechanical Stage 40x40 R/L, Reflected Light

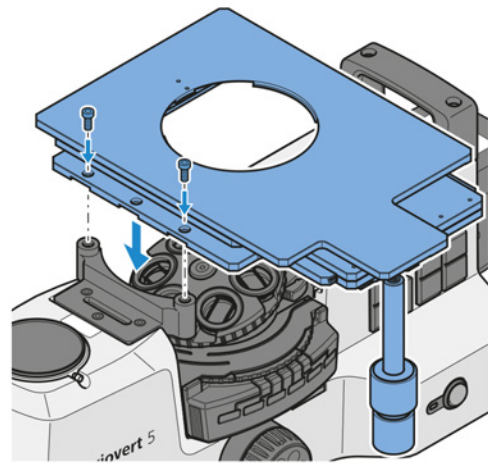
#### Info

Depending on your preferences, the stage can be mounted with the drive on the right- or the left-hand side.

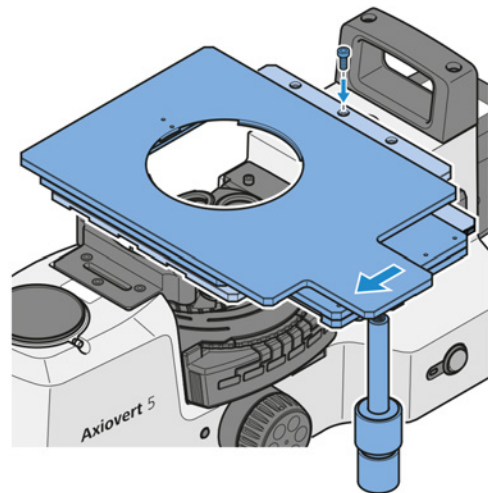
**Parts and Tools**  Hex Key, 3.0 mm

**Prerequisite**  The nosepiece is in the lowest position.

- Procedure**
1. From the stage's bottom side, remove the adhesive tape.
  2. Take the stage and position it according to your preferences with the coaxial drive on the right or left handside.
  3. Using the coaxial knurled knob for Y adjustment, move the stage to its rearmost position.  
→ The front mounting holes are accessible.
  4. Set down the stage on the stand, matching its front mounting holes to those of the stand.



5. Fix the stage to the stand with two screws.
6. Using the coaxial knurled knob for Y adjustment, move the stage to the foremost position.



- The rear mounting holes are accessible.
7. Fix the stage to the stand with a screw in the middle mounting hole.
  8. Use stage insert D = 115 mm for positioning of the sample.

Proceed in the reverse order for removal.

#### 4.7.4 Assembling the Scanning Stage 130x85 mot P; CAN

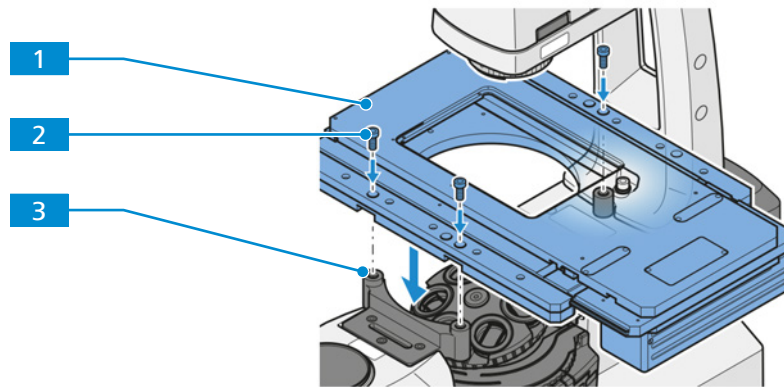


Fig. 43: Installing the scanning stage 130x85 mot P; CAN

- |                             |                            |
|-----------------------------|----------------------------|
| <b>1</b> Scanning stage     | <b>2</b> Fixing screw (3x) |
| <b>3</b> Mounting hole (3x) |                            |



**Parts and Tools**  Hex Key, 3.0 mm

#### Info

The Scanning stage 130x85 mot P; CAN is not compatible with the Aqua stop II.

#### Info

For more information on electronic connection of the scanning stage, refer to its operating manual.

- Prerequisite**  The stage's travel range has been adjusted as required [[▶ 131](#)].  
 The nosepiece is in the lowest position.

- Procedure**
- Set down the stage **1** on the stand, matching its mounting holes to those of the stand **3**.
  - Fix the stage to the stand with a screw **2** in each of the stage's three mounting holes.
  - Connect the joystick, trackball or coaxial drive to the scanning stage.
  - Connect the stage to the user PC via CAN cable and CAN-USB converter.
  - From the stage's bottom side, remove the transport securing pin.
  - For positioning of the sample, place the mounting frame K, low profile or the mounting frame for steel samples in the opening of the stage.

#### NOTICE

##### Damage due to mechanical shocks

Transporting the stage without transport securing pin may impair with the stage's functioning or even damage the stage.

- ▶ Always screw in the transport securing pin before transporting the stage or storing it away.

Proceed in the reverse order for removal.

## 4.8 Assembling the Condenser

The present section applies to the following microscope types:

- Axiovert 5 TL
- Axiovert 5 TL SCB
- Axiovert 5 TL FL SCB
- Axiovert 5 RL TL SCB
- Axiovert 7 RL TL

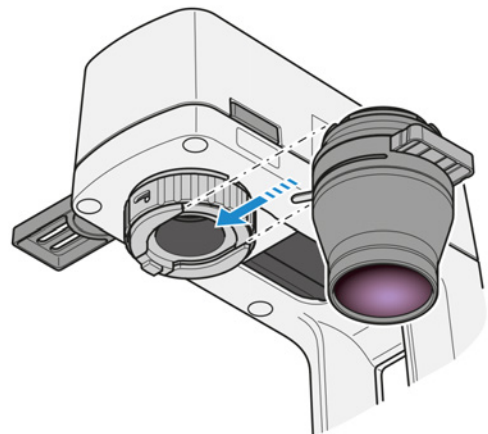
### CAUTION

#### Eye injury due to light emission

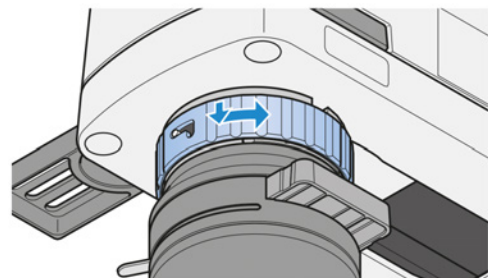
Directly looking into emitted light can damage the eye.

- ▶ Switch off the light source by switching of the microscope or disconnecting the power supply of external light sources before assembling the condenser.
- ▶ Do not look into the light emitting aperture of the light source.

- Procedure**
1. Turn the locking ring of the quick-action locking mechanism to the right, push it upward and hold it in this position.  
→ The quick-action locking mechanism is unlocked.
  2. Insert the condenser in the desired angular position into the mount from the right.



3. Allow the locking ring to slide downward until the condenser snaps into position.



4. Turn the locking ring of the quick-action locking mechanism to the right.  
→ The quick-action locking mechanism is locked.

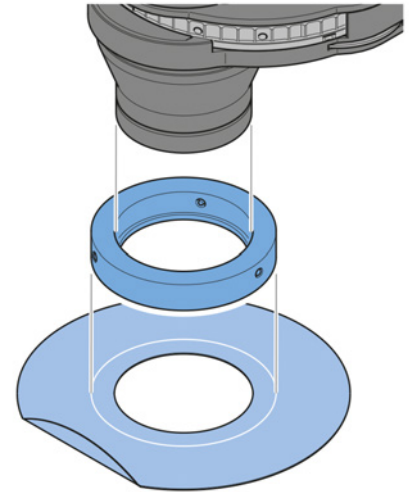
Proceed in the reverse order for removal.



## 4.9 Assembling the Light Shield

**Parts and Tools**  Hex Key, 2.5 mm

**Procedure** 1. Attach the ring to the condenser.



2. Tighten the screws to fix the ring.
3. Hold the light shield with the kinked piece facing upwards.
4. Attach the light shield to the condenser.
  - The light shield is held by magnets.
5. Adjust the light shield to the indicated position marked on it.
6. When not in use, place the light shield under the microscope. It can be pulled out at the side brim.

## 4.10 Assembling Contrast Modules to the Condenser with Modulator Disk


The present section applies to the following components:

- *LD Condenser 0.4 for H Ph PlasDIC DIC iHMC* [[▶ 45](#)]
- *LD Condenser 0.55 for H Ph PlasDIC DIC* [[▶ 46](#)]

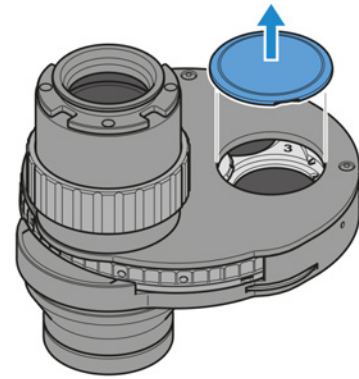
The following modules can be assembled to the condenser:

- Phase stop Ph
- Slit diaphragm PlasDIC
- Condenser module DIC
- iHMC module
- Neutral-density filter 0.05

**Parts and Tools**  Mounting tool  
 Hex Key

**Prerequisite**  *The condenser is rotated so that the mounting hole is accessible* [[▶ 88](#)].

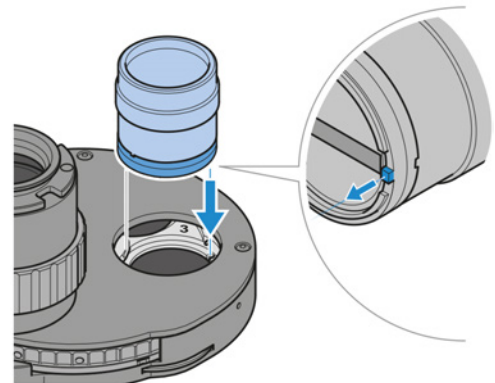
- Procedure**
1. Remove the sealing cap from the mounting hole.



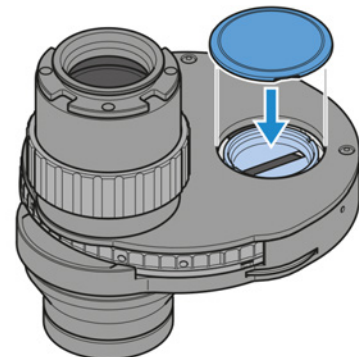
2. Screw the desired contrast module onto the thread of the mounting tool.



3. Loosen the two centering screws on the mounting hole. Use the hex key.
4. Slightly tilt the mounting tool with the contrast module.
5. Insert the contrast module into the mounting hole. Press the bevel of the contrast module socket against the aluminum-colored pressure piece.
6. Rotate the alignment unit of the mounting tool to engage the cam into the recess.



7. Hold the alignment unit and turn the mounting tool to remove it from the contrast module.
8. Insert the sealing cap into the mounting hole.



9. Stick the adhesive labels specifying the contrast modules combinations to the front of the condenser.
10. Only for Phase stop PH and iHMC contrast module: *align the contrast module* [▶ 101].

Proceed in the reverse order for removal.

## 4.11 Loading the 6-Position Reflector Turret

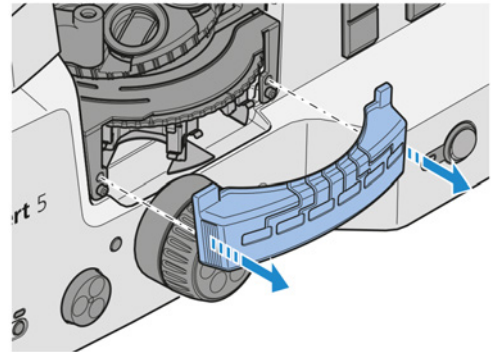
The present section applies to the following microscope types:

- Axiovert 5 TL FL SCB
- Axiovert 5 RL SCB
- Axiovert 5 RL TL SCB
- Axiovert 7 RL
- Axiovert 7 RL TL

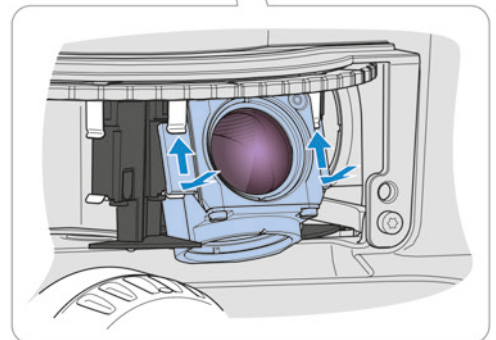
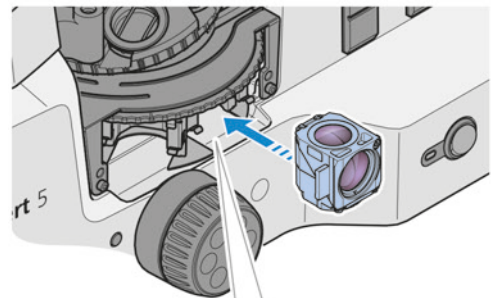
### 4.11.1 Assembling Reflector Modules

To ease the use and the recovery of reflector modules, the modules should be installed to defined positions. The turret positions' numeric markings can be used to identify the modules.

**Procedure** 1. Remove the protective cover.

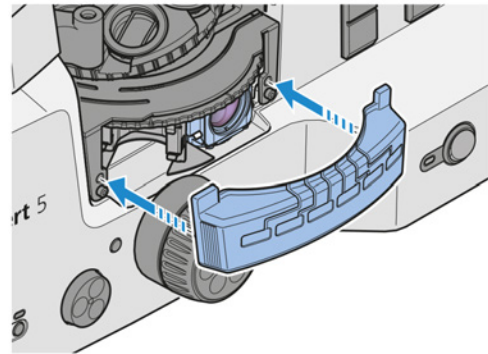


2. **NOTICE** Avoid touching optical surfaces. Carefully grab the module to be installed so that the excitation filter points away from the turret center and the screws point downwards.



3. Tilt the module away from the turret.
4. Press the upper edges of the module's retaining elements to the turret position's upper spring clips.
5. Push the modules lower edge towards the turret's center, so the retaining elements snap in to the lower spring clips.

6. Re-install the protective cover.



7. Stick the adhesive labels specifying the filter combinations utilized for each reflector turret position to the spaces provided on the protective cover.

Proceed in the reverse order for removal.

#### 4.11.2 Assigning Reflector Modules

The reflector modules can be assigned in different ways:

- Assign the reflector modules via OSD.
- Assign the reflector modules via Labscope.
- Assign the reflector modules via MTB.

#### Info

For additional information and detailed descriptions, refer to further applicable documents or ask your ZEISS Sales & Service Partner.

#### 4.11.3 Changing the Filters of a Reflector Module FL P&C

#### NOTICE

##### Sensitive equipment

Changing the optical parts of a reflector module without damage requires considerable skills and utmost care.

- ▶ If possible, use fully equipped reflector modules provided by ZEISS.
- ▶ Take maximum care not to damage any optical or mechanical part when equipping a reflector module.

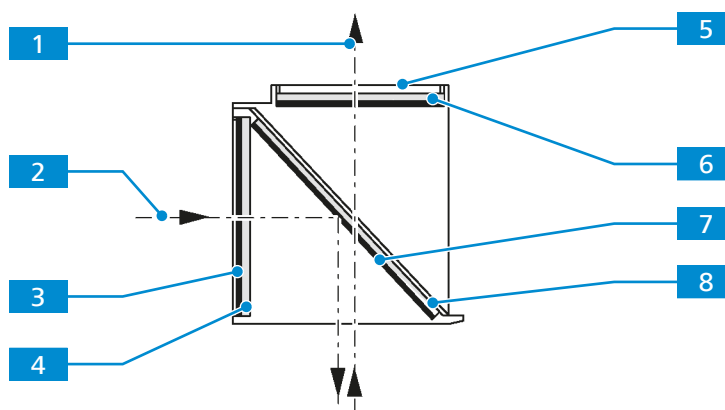


Fig. 44: Mounting the filters and the beam splitter

- |                                                      |                                                    |
|------------------------------------------------------|----------------------------------------------------|
| <b>1</b> Path of the imaging beam                    | <b>2</b> Path of the illumination beam             |
| <b>3</b> Reflective coating of the excitation filter | <b>4</b> Excitation filter                         |
| <b>5</b> Emission filter                             | <b>6</b> Reflective coating of the emission filter |
| <b>7</b> Reflective coating of the beam splitter     | <b>8</b> Beam splitter                             |

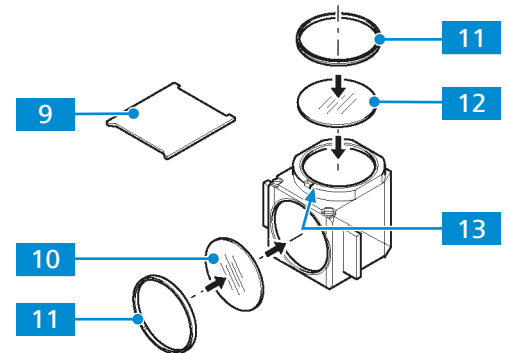
Please note the following orientation rules:

- **Emission filters** **5** with a direction indicating arrow on their circumference must be installed with the arrow pointing to the outside of the reflector module.
- **Emission filters** **5** with a label indicating the wedge angle must be installed such that the label points to the reflector module's orientation notch.
- **Emission filters** **5** with no direction indicating arrow should be installed with the reflective coating pointing to the inside of the reflector module.
- **Excitation filters** **4** with a direction indicating arrow on their circumference must be installed with the arrow pointing to the inside of the reflector module.
- **Excitation filters** **4** with no direction indicating arrow should be installed with the reflective coating pointing to the outside of the reflector module.

- Parts and Tools**
- 🔧 Tool set for filter exchange
  - 🔧 Tweezers

- Prerequisite** ✓ The reflector module is removed from the reflector insert.

- Procedure**
1. Unscrew the filter's retaining ring **11**. Use the corresponding mounting plate of the tool set **9**.



2. **NOTICE** Avoid the contact of sensitive optical components to hard surfaces. Turn the reflector module to let the filter slide out onto a soft surface.
3. Carefully grab the filter **10** / **12** to be installed at its circumference. Use tweezers to carefully grab the filter at its circumference.
4. Place the filter on the reflector module's respective position. Observe the correct orientation **13**.
5. Screw on the retaining ring **11**.

4.11.4 Changing the Beam Splitter of a Reflector Module FL P&C

**NOTICE**

**Sensitive equipment**

Possibility of damage to optical or mechanical parts during the exchange of the beam splitter.

- ▶ If possible, use fully equipped reflector modules provided by ZEISS.
- ▶ Take maximum care not to damage any optical or mechanical part when equipping a reflector module.

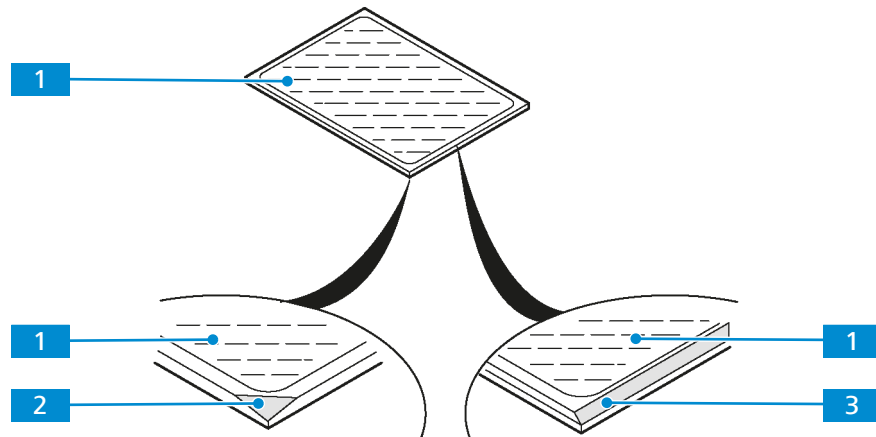


Fig. 45: Labeling the beam splitter

- 1** Reflective coating of the beam splitter
- 2** Beveled corner
- 3** Beveled edge

Please note the following orientation rule:

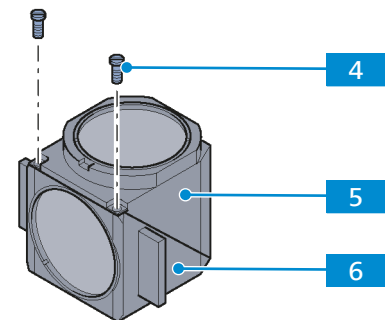
The reflective coating of the beam splitter **1** should point in the direction of the object.

The reflective side of the beam splitter has a beveled edge **3** or corner **2**.

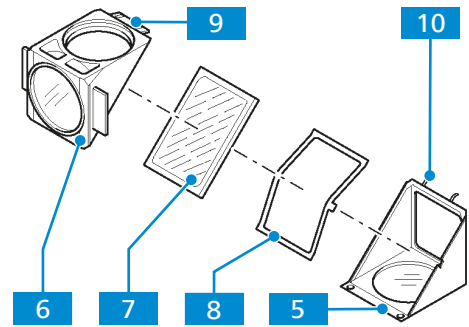
- Parts and Tools**
- 🔧 Tweezers
  - 🔧 Screwdriver, 3.0 mm, ball head

**Prerequisite** ✓ The reflector module is removed from the reflector insert.

- Procedure**
1. Remove both fixation screws **4**.



2. Hold both parts of the reflector module (the emission part **5** and the excitation part **6**) together, and turn the entire reflector module upside down, so that the opening for the emission filter points downwards.



3. Tilt the excitation part **6** and carefully move it to the module's back, so it is released from the retaining pins **10**.
  - The beam splitter **7** lies in front of you.
4. Remove the beam splitter and the spring-loaded frame **8**.
5. Remove the beam splitter from the spring-loaded frame.
6. Use tweezers to pick up the new beam splitter.
7. Position the beam splitter on the spring-loaded frame with the coated side pointing upwards.
8. Place the beam splitter on the spring-loaded frame.
9. Place the frame with the beam splitter on the emission half of the reflector module. Make sure the frame's catch is positioned in the corresponding recess of the reflector module.
10. Carefully reassemble the module's upper and lower part, threading the upper part's eyelets **9** onto the corresponding pins on the lower part.
11. Turn the entire reflector module upside down, so that the opening for the emission filter points upwards.
12. Screw the fixation screws in place.
13. Attach the adhesive label with the name of the filter combination to the reflector module's side wall.

## 4.12 Assembling the Reflected Light LED 10W Light Source

The present section applies to the following microscope types:

- Axiovert 5 RL SCB
- Axiovert 5 RL TL SCB
- Axiovert 7 RL
- Axiovert 7 RL TL

### **⚠ CAUTION**

#### **Eye damage or skin irritation due to hazardous light emission**

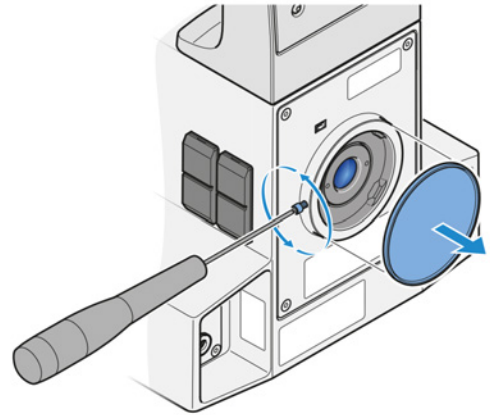
The light source belongs to Risk Group 2 as specified in IEC 62471 and emits LED radiation and UV radiation. Eye damage or skin irritation may result from exposure.

- ▶ Never look directly into the light-emitting aperture of the light source.
- ▶ Avoid exposure of skin to the radiation. Use suitable protective equipment/protective clothing if required.
- ▶ Before installing or removing the light source always make sure it is switched off.

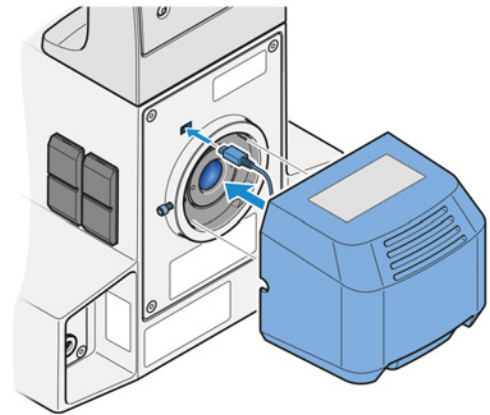
**Parts and Tools** 🔧 Hex Key, 3.0 mm

**Prerequisite** ✓ The microscope is switched off.

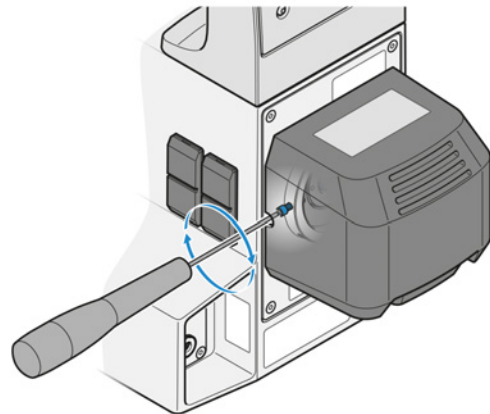
- Procedure**
1. At the illumination mount on the rear side of the stand, remove the protective cap.
  2. Loosen the clamping screw.



3. Connect the cable of the reflected light source to the stand.



4. Insert the dovetail ring of the light source into the illumination mount.
5. Fasten the clamping screw.



Proceed in the reverse order for removal.



## 4.13 Assembling the Colibri 3 LED Light Source

The present section applies to the following microscope type:

- Axiovert 5 TL FL SCB

### **WARNING**

#### **Skin or eye injury due to hazardous light emission**

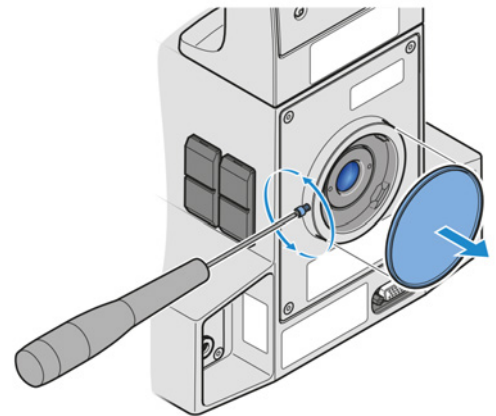
The light source belongs to Risk Group 3 as specified in IEC 62471 and emits LED radiation and UV radiation. Skin or eye injury can result from the exposure.

- ▶ Avoid any eye and skin exposure to the light-emitting aperture of the light source.
- ▶ Avoid exposure of skin to the radiation. Use suitable protective equipment/protective clothing if required.
- ▶ Before installing or removing the light source always make sure it is switched off.

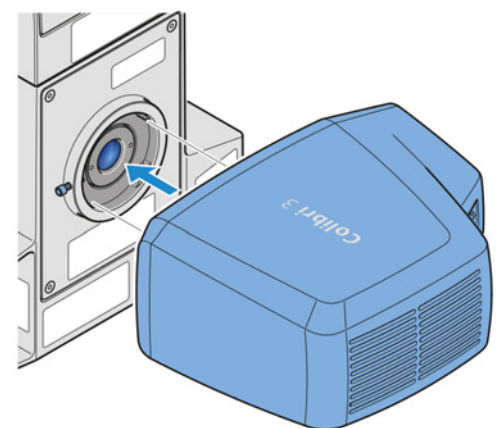
**Parts and Tools**  Hex Key, 3.0 mm

**Prerequisite**  The microscope is switched off.

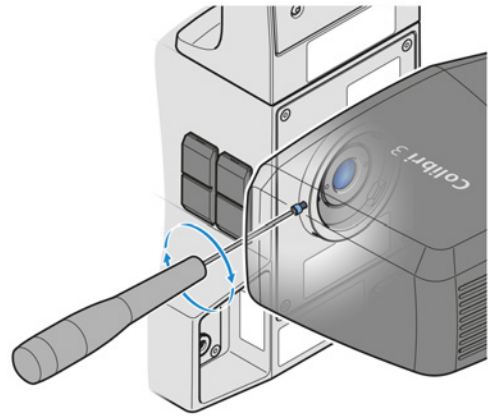
- Procedure**
1. At the illumination mount on the rear side of the stand, remove the protective cap.
  2. Loosen the clamping screw.



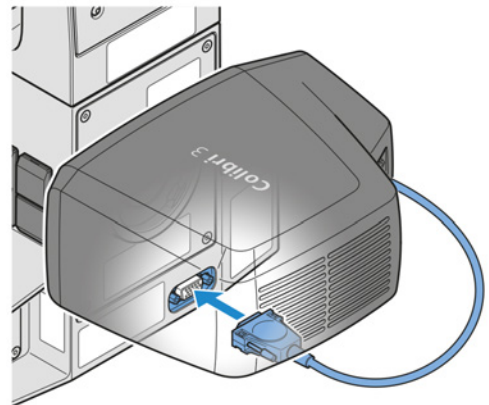
3. Insert the LED light source with the dovetail ring into the illumination mount.



4. Tighten the clamping screw.



5. Connect the LED light source plug to the stand socket.

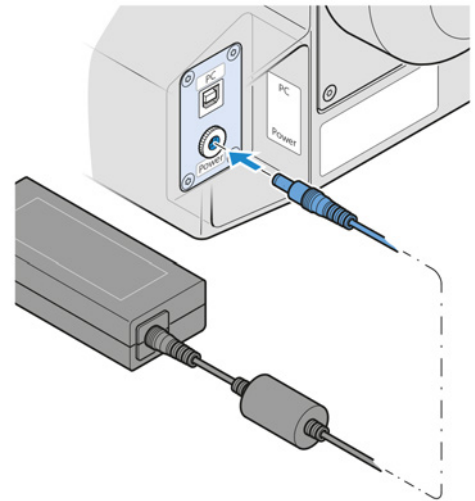


6. Tighten the fixing screws on the plug.  
Proceed in the reverse order for removal.

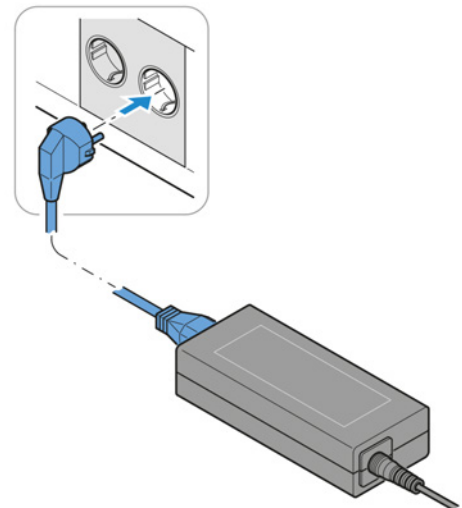
## 4.14 Connecting the Microscope to the Mains

**Prerequisite** ✓ The microscope is switched off and the power cable is unplugged.

**Procedure** 1. Connect the power cable to the **Power** socket.



2. Connect the power cable to the power supply unit.
3. Connect the power supply unit to the mains.



## 5 Operation

This chapter describes switching on/off the microscope as well as the operating steps with the microscope.

### Info

For additional information and detailed descriptions, refer to further applicable documents or ask your ZEISS Sales & Service Partner.

### Info

Further information on the software and its operation is available in the software's online help.

### 5.1 Prerequisites for Commissioning and Operation

The following basic prerequisites are necessary for commissioning and operation:

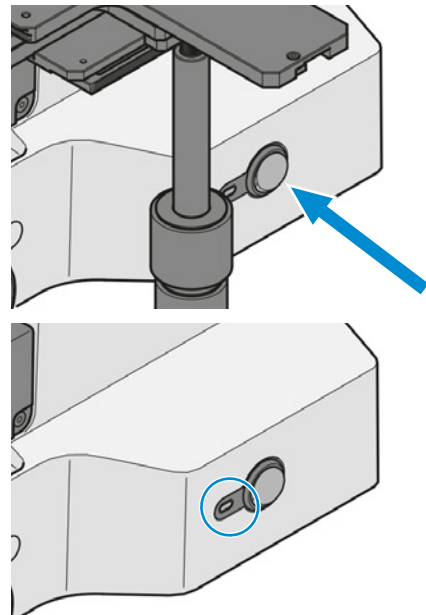
- This document was read prior to commissioning or operation and kept for further use.
- The chapter **Safety** was read and understood.
- The operator is acquainted with the general Windows®-based programs.
- If required: Basic training and safety briefing were successfully completed.

### 5.2 Switching On the Microscope

**Prerequisite** ✓ The microscope is connected to the mains.

**Procedure** 1. Set the **Power** switch to position I.

→ The power indicator lights up with green light.



## 5.3 Adjusting

### 5.3.1 Adjusting the Position of the Eyepieces

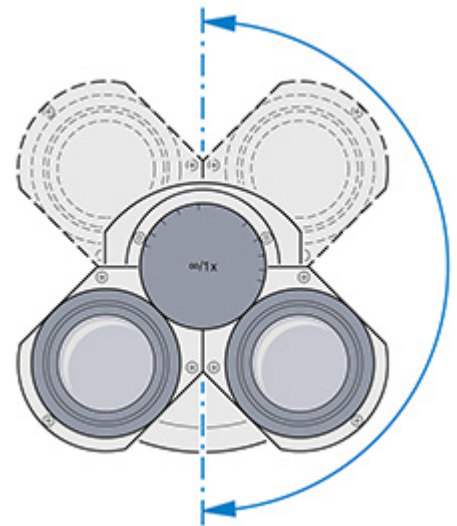
#### Info

The adjustment of the interpupillary distance is correct when you see only one round image while looking through the two eyepieces.

- Procedure**
1. Set the interpupillary distance by rotating the eyepiece tubes symmetrically toward or away from one another.



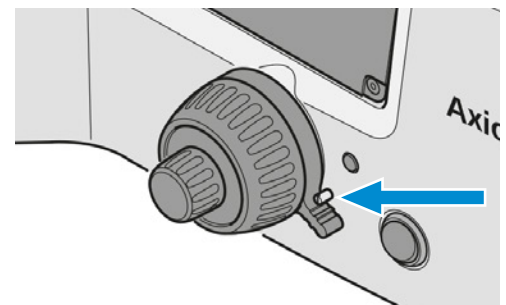
2. Set the viewing height by swivelling the whole eyepiece unit a full 180 ° upwards or downwards.



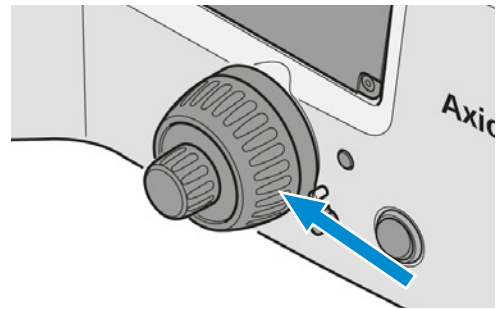
### 5.3.2 Adjusting the Adjustable Focus Stop

- Prerequisite**
- ✓ The microscope is operational.
  - ✓ A sample is positioned on the stage.

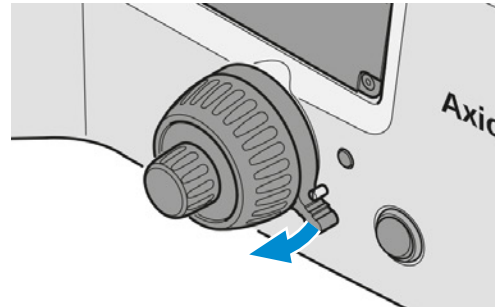
- Procedure**
1. Rotate the clamping lever of the stop upwards to the stop pin.



- Carefully, move the nosepiece to the required upper position. Use the focusing drive.



- Press the clamping lever downwards to lock the stop position.

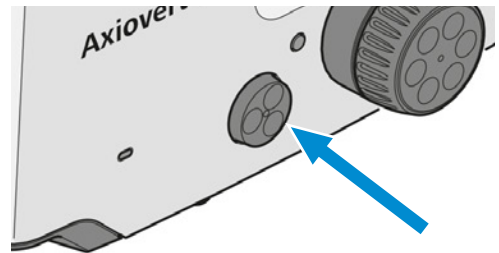


### 5.3.3 Using the Light Manager Function

#### 5.3.3.1 Switching On the Light Manager Function

To switch on the LM function proceed as follows:

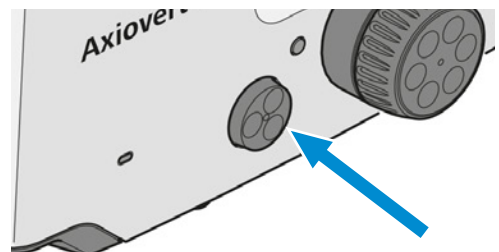
- Procedure**
- Press one of the **Snap** buttons and the **Intensity/LM** knob simultaneously for at least 1.5 seconds.



→ The indicator light blinks in the following sequence: GREEN/GREEN/GREEN.

#### 5.3.3.2 Saving Light Intensity Values

- Procedure**
- Switch to the first objective and/or reflector positions of interest.
  - Set the desired light intensity.
  - Press the **Intensity/LM** knob for at least 1.5 seconds.

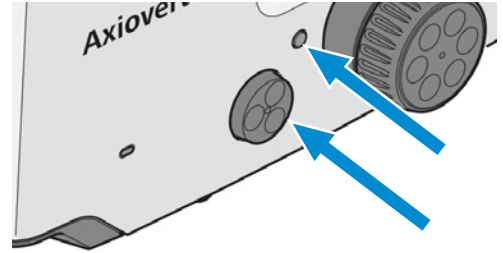


- The LED indicator of the light source blinks green twice.
  - The light source blinks once. This is visible through the eyepieces and on the monitor.
- Repeat this procedure to set light intensity values for more objective/reflector combinations.

### 5.3.3.3 Switching Off the Light Manager Function

To switch off the LM function proceed as follows:

- Procedure**
1. Press one of the **Snap** buttons and the **Intensity/LM** knob simultaneously for at least 1.5 seconds.

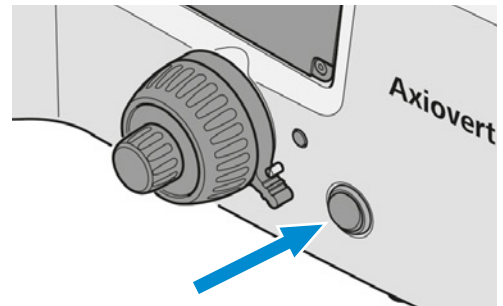


→ The indicator light blinks in the following sequence: GREEN/ORANGE/GREEN.

### 5.3.4 Activating the ECO/Permanent Mode

**Prerequisite** ✓ The microscope is operational.

- Procedure**
1. Select the ECO or Permanent mode for microscope illumination using the **ECO/Permanent** mode switch.



### 5.3.5 Setting the Parfocal Alignment

The present section applies to the following microscope types:

- Axiovert 7 RL
- Axiovert 7 RL TL

#### NOTICE

##### Collision of the objective with the sample due to incorrect setting

The objective can collide with the sample and damage the microscope if the parfocal alignment procedure was performed incorrectly.

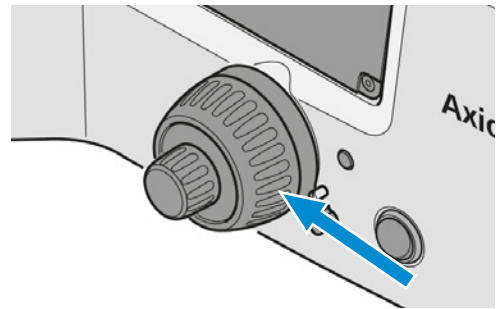
- ▶ Follow the described setting procedure.

**Prerequisite**

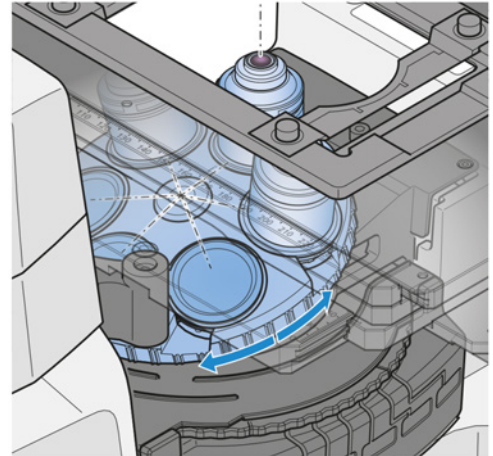
- ✓ The microscope is operational.
- ✓ The Light Manager function is switched on.

- Procedure**
1. Press the left **Snap button** and the **Intensity/LM knob** simultaneously for > 8 s.
    - The LED indicator turns to red.
    - The Parfocality alignment mode is activated.

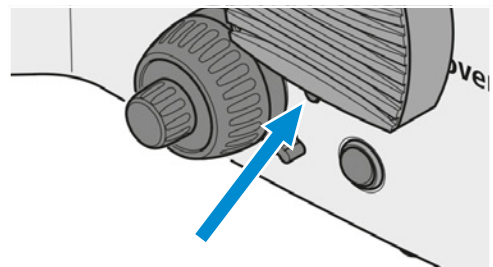
2. Focus the sample with a medium objective magnification.



3. Bring the objective with the highest magnification into the beam path and refocus, if necessary.



4. Press the left **Snap** button shortly.

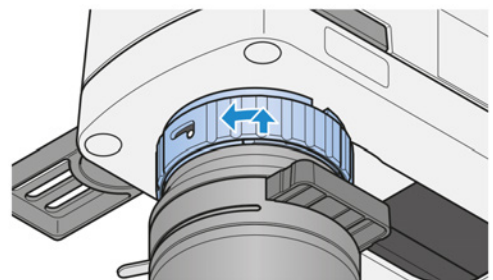


- The LED indicator and the image blink once
  - The parfocality point for this objective is saved.
5. Switch to the second objective.
  6. Repeat to save the parfocality point for all further objectives.
  7. Press the left **Snap button** and the **Intensity/LM knob** simultaneously for > 8 s.
    - The LED indicator turns to green.
    - The Parfocality alignment mode is deactivated.

## 5.4 Rotating the Condenser

**Prerequisite** ✓ *The condenser is installed [▶ 72].*

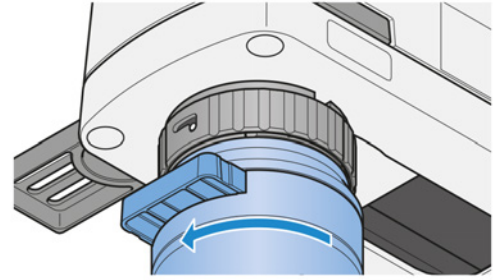
- Procedure**
1. Turn the locking ring of the quick-action locking mechanism to the left and push it upward.



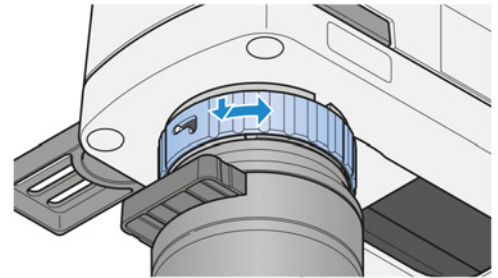
- The quick-action locking mechanism is unlocked.



2. Turn the condenser 90° in the slot until it snaps into place.



3. Allow the locking ring to slide downward.
4. Turn the locking ring of the quick-action locking mechanism to the right.



→ The quick-action locking mechanism is locked.

## 5.5 Moving the Condenser

### NOTICE

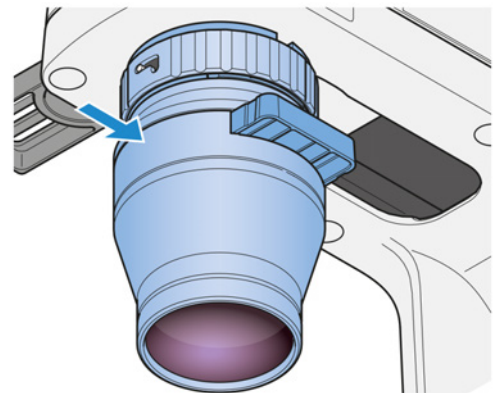
#### Property damage due to collision of condenser and carrier for transmitted light illumination.

Condensers with modulator disk can collide with the carrier for transmitted light illumination when moving the condenser.

- ▶ Rotate condensers with modulator disk so that the modulator disk is either on the right or on the left side before moving them.

**Prerequisite** ✓ *The condenser is installed [▶ 72].*

- Procedure**
1. If required, *rotate the condenser [▶ 88].*
  2. Grab the adapter ring.
  3. Carefully push the condenser backwards.






4. Insert the large sample.

## 5.6 Setting Up for Transmitted Light Techniques

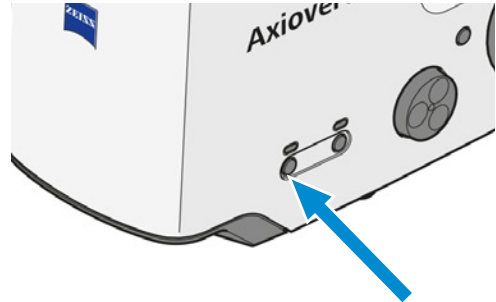
### 5.6.1 Setting Up for Transmitted Light Brightfield Microscopy

Every microscope with transmitted light illumination is configured to work with the transmitted light brightfield (TL) method.

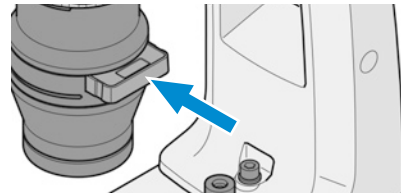
**Parts and Tools**  Condenser for TL brightfield

**Prerequisite**  The microscope is operational.  
 The focus stop is *adjusted* [[▶ 85](#)].

**Procedure** 1. If required, push the **TL** button for transmitted light illumination.

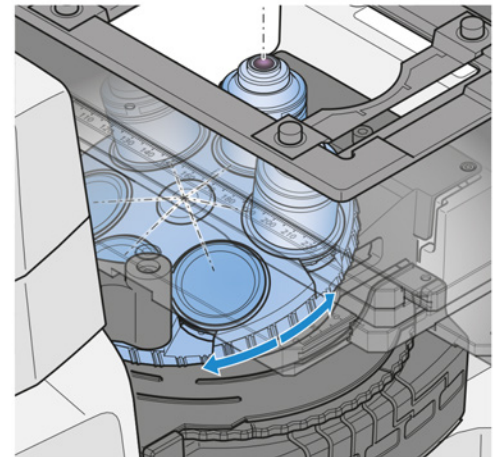


2. Move the brightfield position of the condenser slider/turret into the beam path.

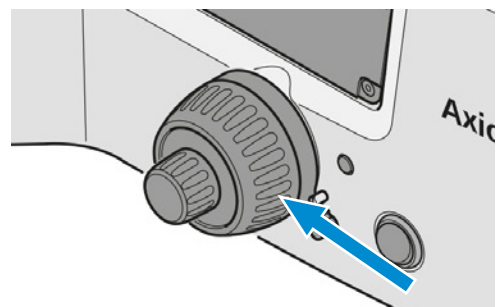


3. Place the sample on the stage.

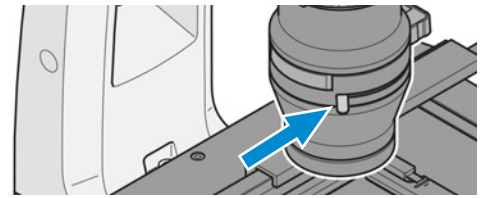
4. Swivel in the 10x objective on the nosepiece into the beam path.



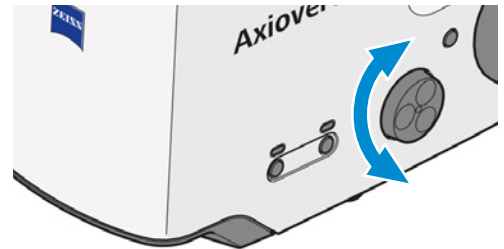
5. Focus the sample.



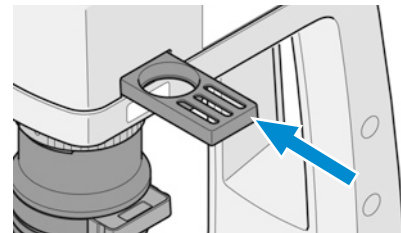
6. Use the lever or the setting wheel to close the aperture diaphragm until optimum contrast is obtained.



7. If required, adjust the illumination intensity by turning the **LM** knob.



8. If required, bring the attenuation filter into the beam path.



### Info

Never use the aperture diaphragm to adjust image brightness. Use the illumination intensity control for this purpose!

## 5.6.2 Setting Up for Transmitted Light Differential Interference Contrast Microscopy

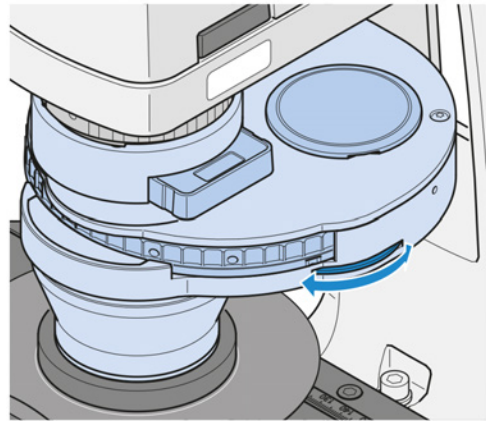
### Info

The DIC method works with polarized light. It is disturbed when birefringent elements, e.g. foils, are put between polarizer and analyzer, as is sometimes done when doing a histological incision. The same situation occurs with Petri dishes or sample holders which have a plastic base. In these cases we recommend using the PlasDIC method.

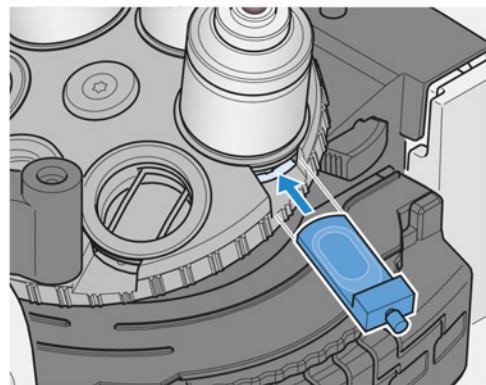
- Parts and Tools**
- 🔧 Condenser with built-in condenser module DIC
  - 🔧 Objective for DIC with compatible DIC slider
  - 🔧 Three-position contrast slider with built-in analyzer
  - 🔧 Alternatively, one of the following analyzer modules is assembled to the in the reflector turret:
    - Analyzer module Pol ACR P&C for transmitted light
    - Analyzer module DIC ACR P&C for transmitted light
    - Analyzer module DIC ACR P&C shift free for transmitted light

- Prerequisite** ✓ The microscope is operational.

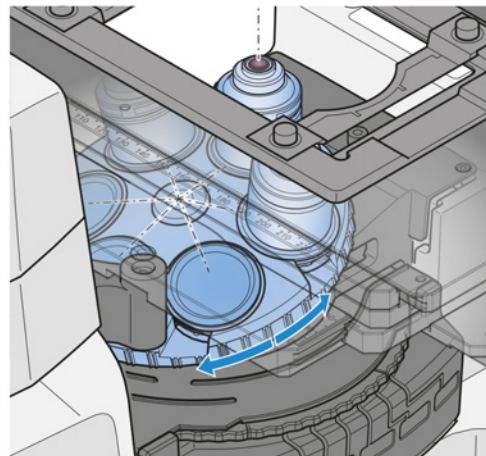
- Procedure**
1. Fully open the aperture diaphragm of the condenser.



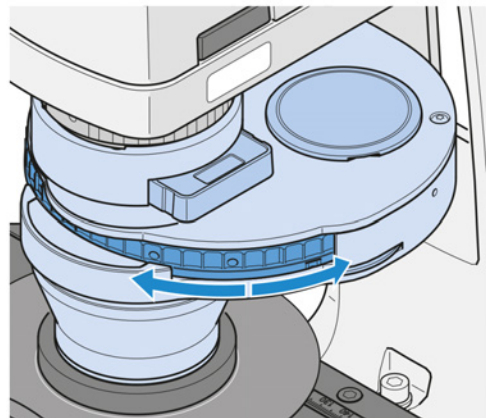
2. Place the sample on the stage.
3. Slide the according DIC slider into the slot of the appropriate objective position.



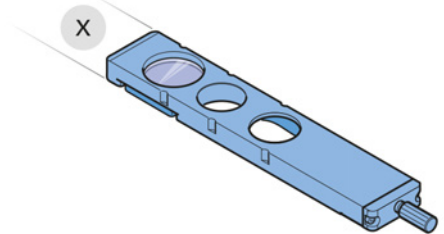
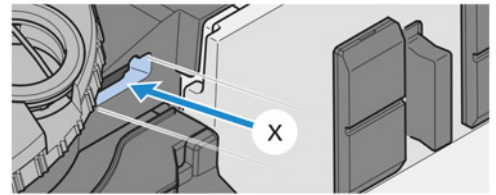
4. Bring the objective for DIC into the beam path.



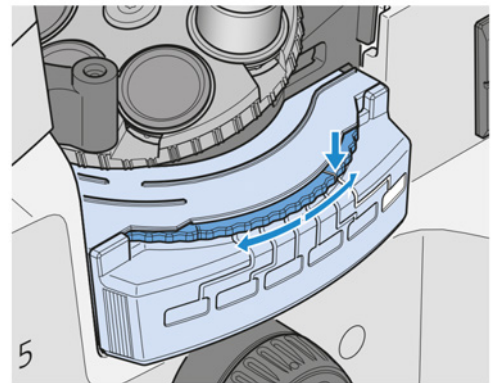
5. On the condenser, swivel the suitable DIC I, II or III condenser module into the light path.



6. If applicable, slide the three-position contrast slider built-in analyzer into the stand.



7. If applicable, rotate the analyzer module on the reflector turret into the beam path. Watch for the correct locking position.



8. With the knurled screw on the DIC slider, adjust the optimal contrast. Setting the DIC slider symmetrically along its center position makes the sample details appear as if they were raised or recessed.

### 5.6.3 Setting Up for Transmitted Light PlasDIC Microscopy

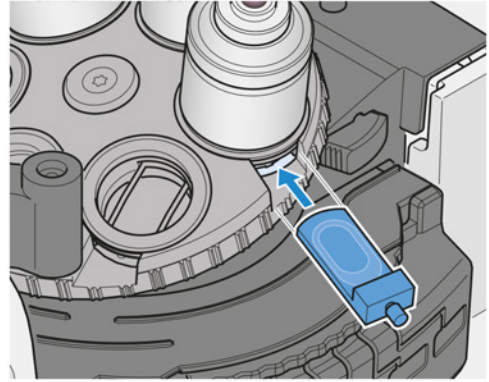
In the present section two alternatives for setting PlasDIC microscopy in transmitted light are described.

#### 5.6.3.1 Setting PlasDIC with PlasDIC Slider on the Objective

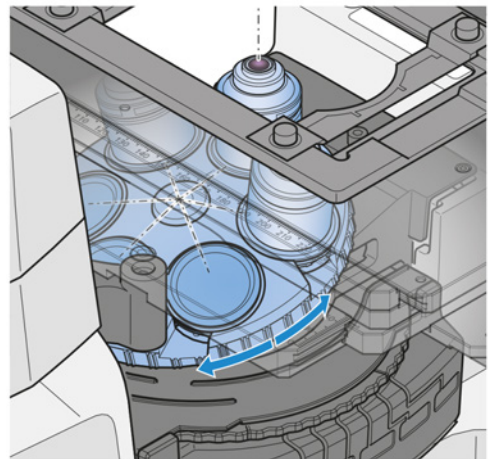
- Parts and Tools**
- 🔧 Objective for PlasDIC with compatible *PlasDIC slider* [▶ 154]
  - 🔧 LD Condenser 0.4 H Ph PlasDIC DIC iHMC with *slider 10x46 mm Ph/PlasDIC, H, Ph/PlasDIC* [▶ 154] and built-in slit diaphragm for PlasDIC
  - 🔧 alternatively: LD Condenser 0.55 H Ph PlasDIC DIC iHMC with *slider 10x46 mm Ph/PlasDIC, H, Ph/PlasDIC* [▶ 154] and built-in slit diaphragm for PlasDIC
  - 🔧 DIC P&C analyzer module Pol in the reflector turret
  - 🔧 alternatively: Three-position contrast slider with built-in analyzer fixed for contrast slider

- Prerequisite** ✓ The microscope is operational.

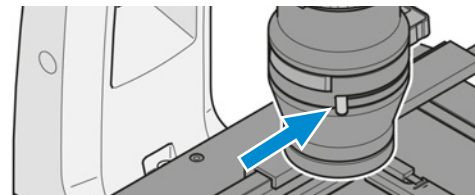
**Procedure** 1. Slide the slider PlasDIC into the slit of the appropriate objective position.



2. Swivel the PlasDIC compatible objective into the beam path.

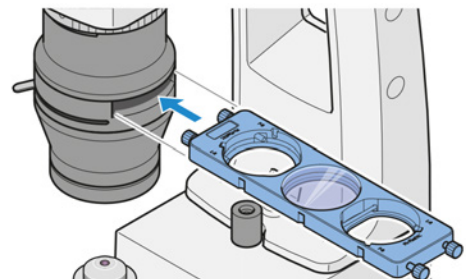


3. Fully open the aperture diaphragm of the condenser.



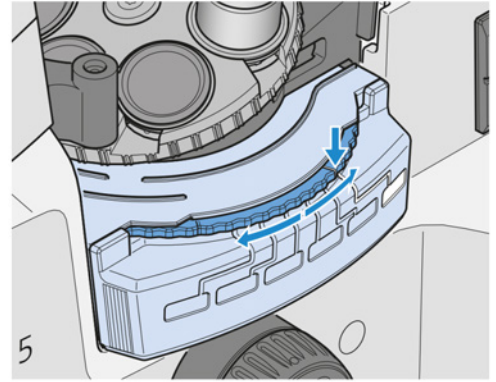
4. Place the sample on the stage.

5. Bring the PlasDIC position of the condenser slider into the light path.

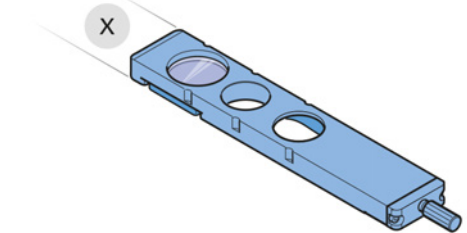
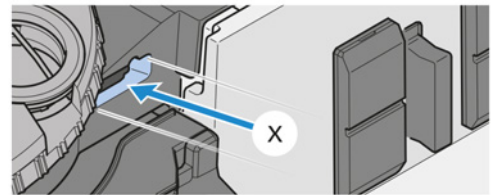


6. If required, increase the illumination brightness.

7. If applicable, rotate the DIC P&C analyzer module Pol on the reflector turret into the beam path. Watch for the correct locking position.



8. If applicable, slide the three-position contrast slider with built-in analyzer fixed for contrast slider into the slot below the nosepiece.



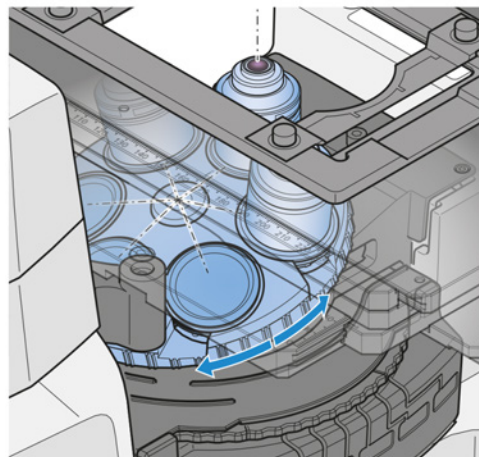
9. With the knurled screw on the PlasDIC slider, adjust the optimal contrast.  
 → Structures may be shown in relief or in pseudo darkfield images. Relief imaging delivers the best contrast.

### 5.6.3.2 Setting PlasDIC with PlasDIC Module on the Contrast Slider

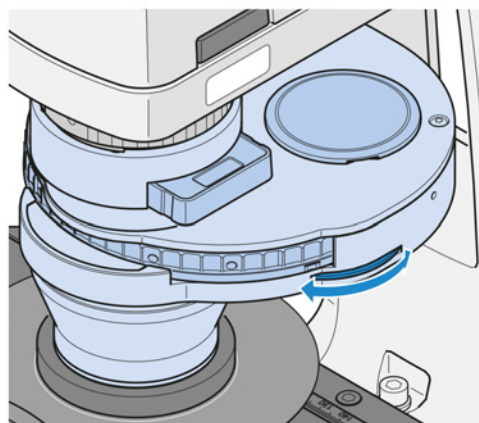
- Objective for PlasDIC
- LD Condenser 0.4 H Ph PlasDIC DIC iHMC with built in slit diaphragm for PlasDIC
- alternatively: LD Condenser 0.55 H Ph PlasDIC DIC iHMC with built in slit diaphragm for PlasDIC
- Three-position contrast slider with built-in LD A-Plan 10x-63x PlasDIC module (suitable for LD A-Plan 10x to 63x objectives)

**Prerequisite** ✓ The microscope is operational.

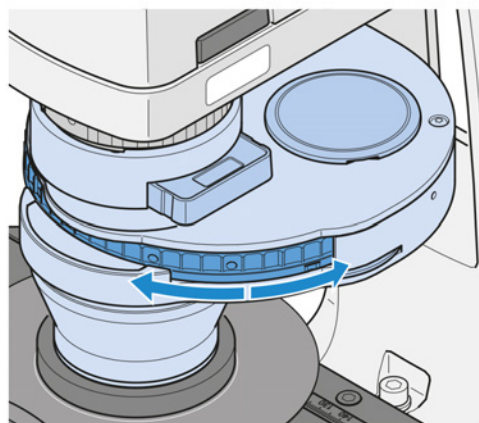
- Procedure**
1. Swivel the PlasDIC compatible objective into the beam path.



2. Fully open the aperture diaphragm of the condenser.



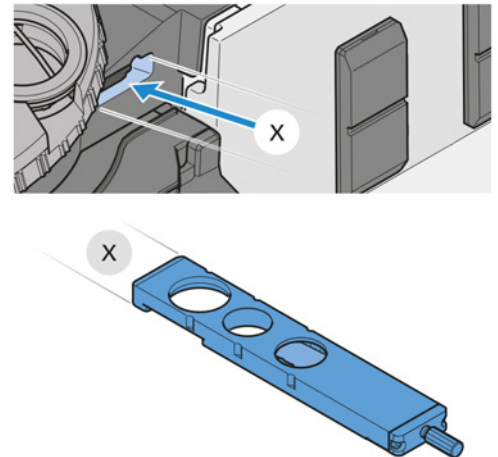
3. Place the sample on the stage.
4. Rotate the condenser position with the slit diaphragm for PlasDIC into the beam path.



5. If required, increase the illumination brightness.



- Slide the three-position contrast slider into the slot below the nosepiece (an analyzer is not necessary). Choose the position with the PlasDIC module.



- With the knurled screw on the PlasDIC module, adjust the optimal contrast.
  - Structures may be shown in relief or in pseudo darkfield images. Relief imaging delivers the best contrast.

#### 5.6.4 Setting Up for Transmitted Light Polarization Contrast (Axiovert 5/7 materials)

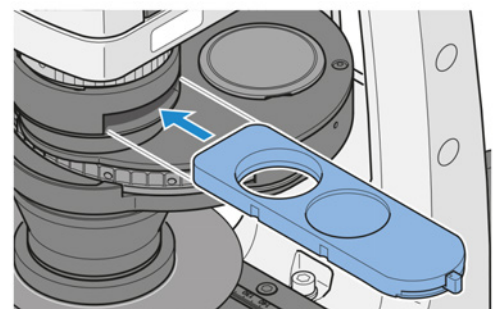
The present section applies to the following microscope types:

- Axiovert 5 RL SCB
- Axiovert 5 RL TL SCB
- Axiovert 7 RL
- Axiovert 7 RL TL

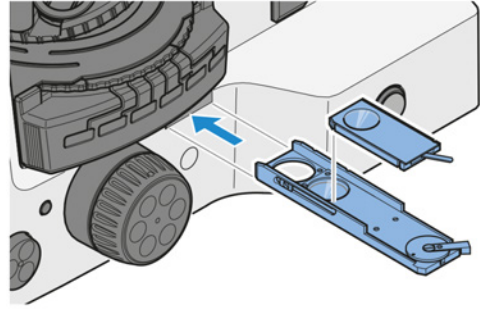
- Parts and Tools**
- 🔧 LD Condenser 0.4 H Ph PlasDIC DIC iHMC
  - 🔧 alternatively: LD Condenser 0.3 for slider
  - 🔧 alternatively: LD Condenser 0.4 for slider
  - 🔧 Polarizer Slider D 10x46 mm, 90° rotatable
  - 🔧 Analyzer slider A 12x35 mm, 90° rotatable

- Prerequisite**
- ✓ The microscope is operational.
  - ✓ The microscope is adjusted for *transmitted light brightfield microscopy* [▶ 90].

- Procedure**
- On the condenser, bring the polarizer slider D into the beam path.



- Slide the analyzer slider A 12x35 mm, 90° rotatable into the slot under the reflector turret. The analyzer slider may be inserted both from the left-hand and the right-hand side.

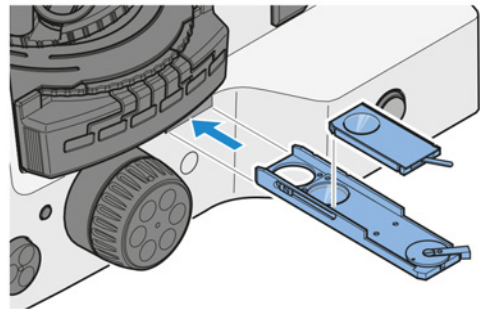


- Using the polarizer slider lever, cross the vibration directions of the analyzer and the polarizer until the field of view has reached the extinction position - maximum darkness.

#### 5.6.4.1 Color-contrasting of anisotropic materials

- Prerequisite**
- ✓ The microscope is operational.
  - ✓ The microscope is adjusted for *transmitted light polarization contrast* [▶ 97].
  - ✓ One of the following components is available:  
compensator Lambda  
or  
compensator Lambda Pol sub.  $\pm 10^\circ$

- Procedure**
- Place the compensator on the analyzer slider A 12x35 mm, 90° rotatable.



- Slide the analyzer slider A 12x35 mm, 90° rotatable with compensator into the slot under the reflector turret .
- Bring the polarizer into the beampath.
- Bring the sample in the light path and focus the sample.  
→ With the compensator Lambda the sample appears pinkish.
- Use the lever of the compensator Lambda to select the best color impression.

#### 5.6.5 Setting Up for Transmitted Light Polarization Contrast (Axiovert 5)

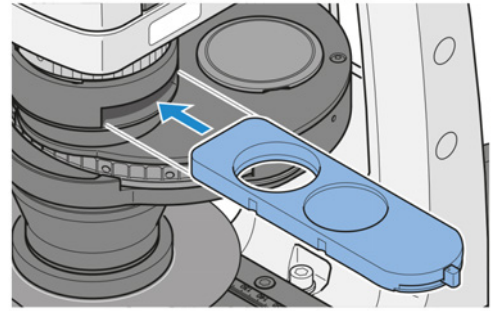
The present section applies to the following microscope types:

- Axiovert 5 TL
- Axiovert 5 TL SCB
- Axiovert 5 TL FL SCB

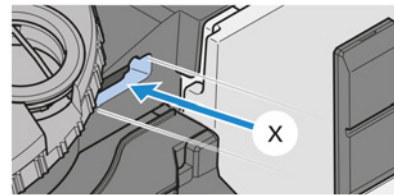
- Parts and Tools**
- 🔧 LD Condenser 0.4 H Ph PlasDIC DIC iHMC
  - 🔧 Polarizer Slider D 10x46 mm, 90° rotatable
  - 🔧 Analyzer fixed for contrast slider 10x29 mm assembled to three-position contrast slider 10x29 mm for PlasDIC module and analyzer
  - 🔧 alternatively: Analyzer module Pol ACR P&C for transmitted light in the reflector turret

- Prerequisite** ✓ The microscope is operational.  
 ✓ The microscope is adjusted for *transmitted light brightfield microscopy* [▶ 90].

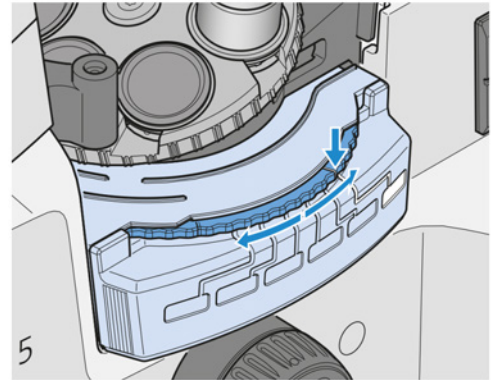
- Procedure** 1. On the condenser, bring the polarizer slider D into the beam path.



2. If applicable, slide the three-position contrast slider with built-in analyzer fixed for contrast slider into the slot below the nosepiece.



3. If applicable, bring the analyzer module Pol ACR P&C into the beam path.



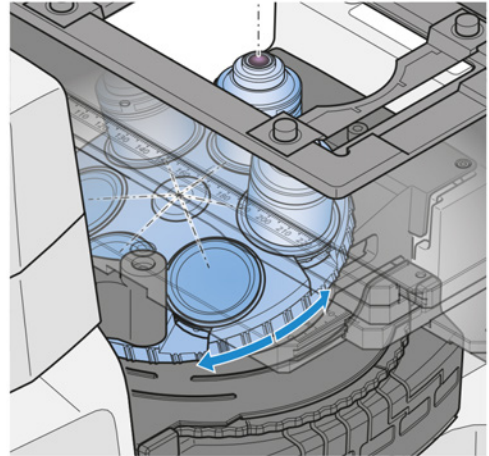
4. Using the polarizer slider lever, cross the vibration directions of the analyzer and the polarizer until the field of view has reached the extinction position - maximum darkness.

### 5.6.6 Setting Up for Transmitted Light Phase Contrast Microscopy

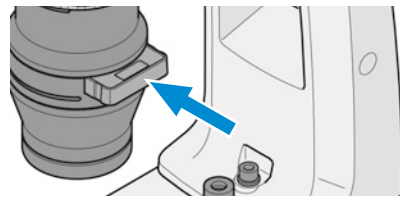
- Parts and Tools**
- 🔧 2 x Hex key, 1.5 mm
  - 🔧 Auxiliary microscope
  - 🔧 Slider 10x46 mm Ph/PlasDIC, H, Ph/PlasDIC

- Prerequisite** ✓ The microscope is operational.  
 ✓ Phase contrast objectives with the phase rings **Ph 1**, **Ph 2** or **Ph 3** are *installed* [▶ 65].  
 ✓ Condenser for slider is *installed* [▶ 72].  
 ✓ A phase ring diaphragm matching the phase contrast objective is installed in the slider.  
 ✓ The illumination is adjusted for *transmitted light brightfield microscopy* [▶ 90].

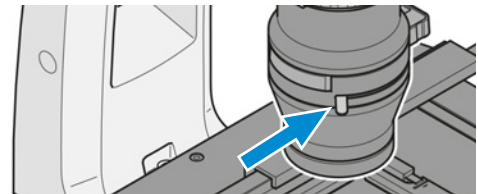
- Procedure** 1. Swivel the phase contrast objective into the beam path (e.g. **Ph1**).



2. Bring the phase diaphragm with the same labeling as the objective (e.g. **Ph1**) into the beam path.



3. Open the aperture diaphragm completely.

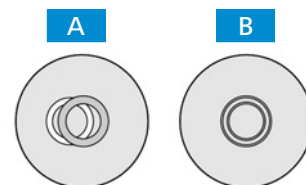


4. Replace one eyepiece [▶ 65] with an auxiliary microscope.  
 5. With the adjusting fixture on the auxiliary microscope, focus the annular phase diaphragm and the phase ring in the objective exit pupil.

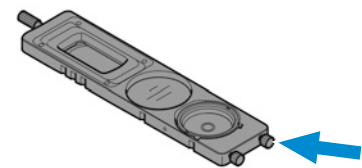
6. Check the centering and the overlap of the lighter annular phase diaphragm (in the condenser) with the darker phase ring (in the objective).

Both rings must be centered and overlapping

**B**.



7. If the overlap is not exact **A**, recenter the lighter annular diaphragm.  
 8. Turn the setting screws on the slider, until the overlap is exact.



9. Remove the auxiliary microscope and replace the eyepiece.

### Info

All phase contrast objectives used require adjustment of the phase plates. When examining liquid objects in small vessels, the optical path must be aligned to the center of the vessel, as liquids at the edge of a vessel act as a lens and adversely affect the microscope image.

### 5.6.7 Setting Up for Transmitted Light iHMC

- Parts and Tools**
- 🔧 2 x Hex key, 1.5 mm
  - 🔧 Auxiliary microscope
  - 🔧 LD Condenser 0.4 H Ph PlasDIC DIC iHMC
  - 🔧 Condenser module for iHMC
  - 🔧 Objective for iHMC
  - 🔧 Polarizer Slider D 10x46 mm, 90° rotatable
1. *Aligning the iHMC Module in the Condenser* [▶ 101]
  2. *Aligning the iHMC Diaphragm* [▶ 101]
  3. *Operation during Experiments* [▶ 103]

#### 5.6.7.1 Aligning the iHMC Module in the Condenser

- Parts and Tools** 🔧 2 x Hex key, 1.5 mm

- Prerequisite**
- ✓ The microscope is operational.
  - ✓ The iHMC module is installed.

- Procedure**
1. Turn the clamping ring on the condenser to the left.
  2. Lift the clamping ring.
  3. Turn the condenser 90° to the right until it locks into position.
    - The change position is on the right-hand side of the transmitted light illumination carrier.
  4. Swivel the iHMC position of the condenser into the change position.
  5. Precenter the iHMC module in the mount, based on visual judgment.
  6. Turn the condenser back to its initial orientation until it snaps into position.
  7. Turn the clamping ring to the right for locking.

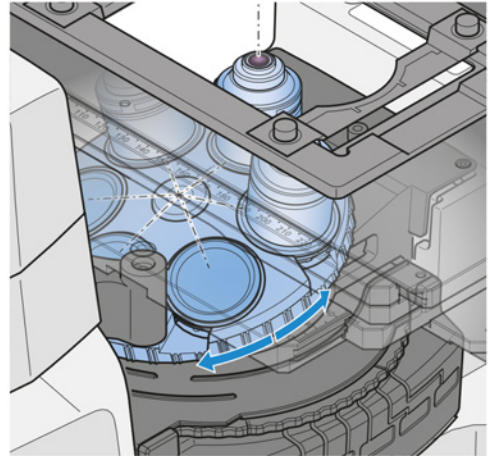
The diaphragm of the iHMC module can be positioned individually in the mount according to the desired orientation of the relief impression in the field of view, see examples A and B. Different variants to the examples (changing the position shown by up to 45°) are possible. If iHMC is intended for several magnifications, the diaphragms of the iHMC modules should be positioned in an analogous manner, since the relief impression then has the same orientation for all magnifications.

#### 5.6.7.2 Aligning the iHMC Diaphragm

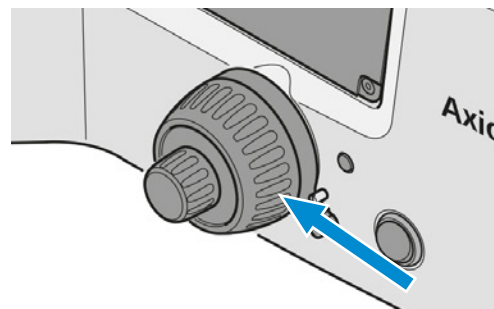
- Parts and Tools**
- 🔧 Auxiliary microscope
  - 🔧 2 x Hex key, 1.5 mm

- Prerequisite**
- ✓ The microscope is operational.
  - ✓ *The iHMC module in the condenser is aligned* [▶ 101].

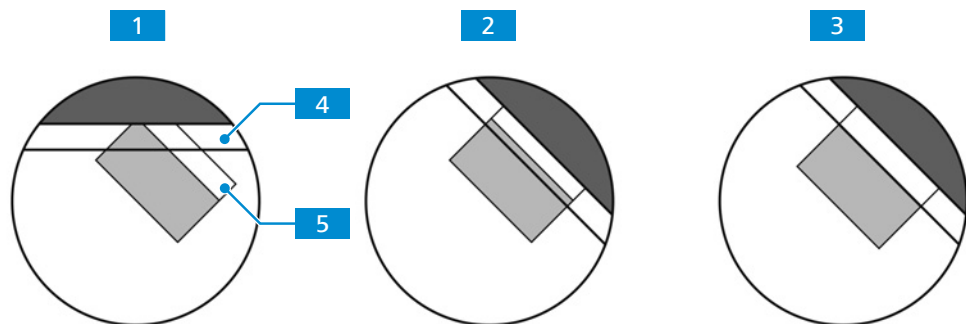
**Procedure** 1. Turn the iHMC objective into the light path.



2. Place a typical sample in a cultivation dish on the stage.
3. Focus the sample.



4. Replace one eyepiece [▶ 65] with an auxiliary microscope.

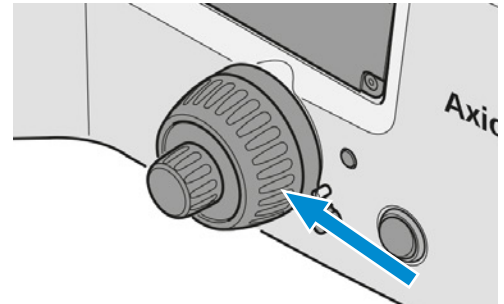


- The rear focal plane of the objective is visible through the auxiliary microscope **1**.
5. Adjust the eye lens of the auxiliary microscope to bring the zone plate of the objective **4** and the iHMC diaphragm **5** in focus.
  6. Turn the ring of the iHMC objective until the zone plate is aligned parallel to iHMC diaphragm **2**.
  7. Move the iHMC diaphragm until area **4** of the zone plate and area **5** of the iHMC diaphragm line up completely in middle position if possible **3**. Use the hex keys.
  8. Remove the auxiliary microscope.
  9. Attach the condenser sticker for the iHMC magnification to the corresponding surface for the condenser position used.

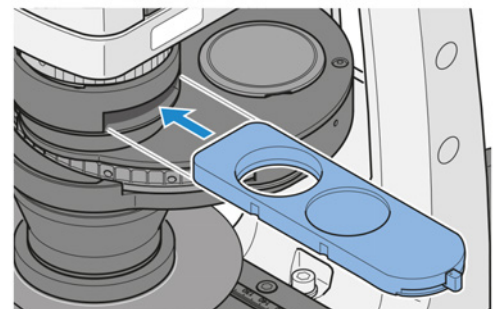
### 5.6.7.3 Operation during Experiments

- Prerequisite**
- ✓ The microscope is operational.
  - ✓ The iHMC module in the condenser is aligned [▶ 101].
  - ✓ The iHMC diaphragm is aligned [▶ 101].

- Procedure**
1. Place the sample on the stage.
  2. Focus the sample.



3. Insert the polarization slider into the condenser.



4. Fine adjust the contrast on the polarization slider.

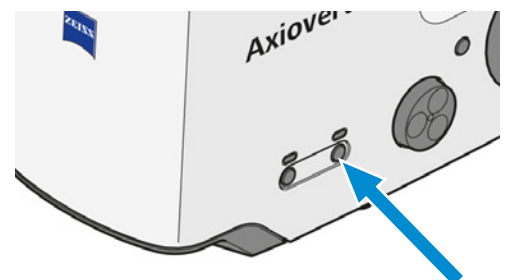
## 5.7 Setting Up for Reflected Light Techniques

### 5.7.1 Setting Up for Reflected Light Brightfield Microscopy

- Parts and Tools**
- 🔧 Screwdriver, 3.0 mm, ball head
  - 🔧 Reflector module brightfield ACR P&C for reflected light
  - 🔧 Stop Slider A with Aperture/Luminous Field Diaphragm
  - 🔧 Stop Slider A with Aperture Diaphragm
  - 🔧 High-contrast reflected light sample

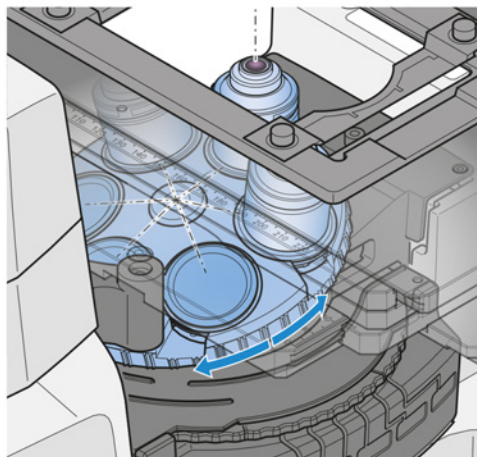
- Prerequisite**
- ✓ A reflected light illuminator is *installed* [▶ 157] and adjusted, if required.
  - ✓ The microscope is operational.
  - ✓ only for Axiovert 7 RL and Axiovert 7 RL TL: *The parfocal alignment is set* [▶ 87].

- Procedure**
1. If required, push the **RL** button for reflected light illumination.

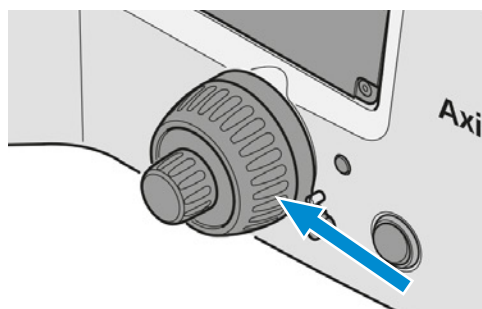


2. Place the sample on the stage.

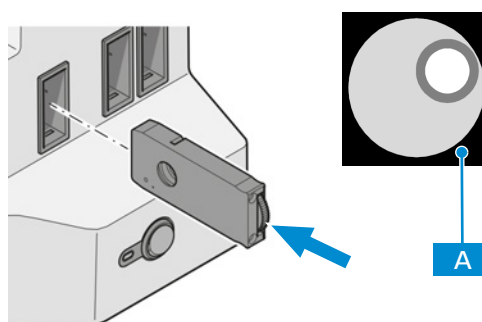
3. Swivel in the 10x objective on the nosepiece.



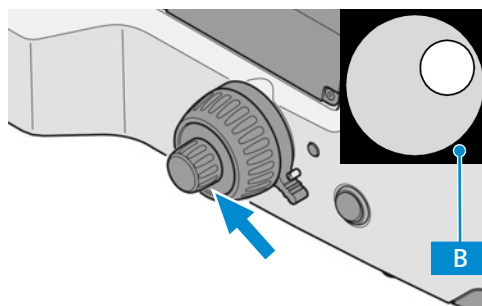
4. Focus the sample.



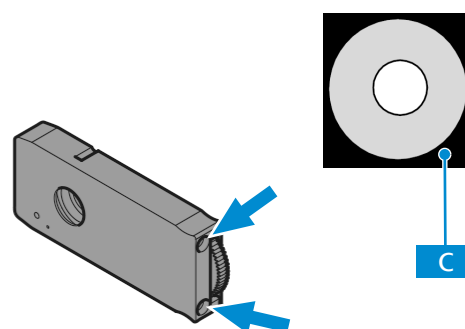
5. Close the luminous-field diaphragm until it is visible (even if not in focus) in the field of view **A**. Use the control wheel of luminous-field diaphragm slider.



6. Bring the edge of the luminous-field diaphragm into focus **B**. Use the focusing drive.

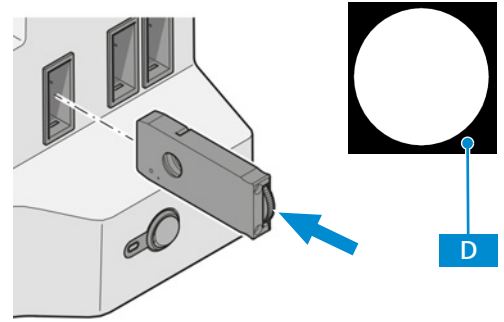


7. Center the luminous-field diaphragm **C**. Use the centering screws of the luminous-field diaphragm slider.

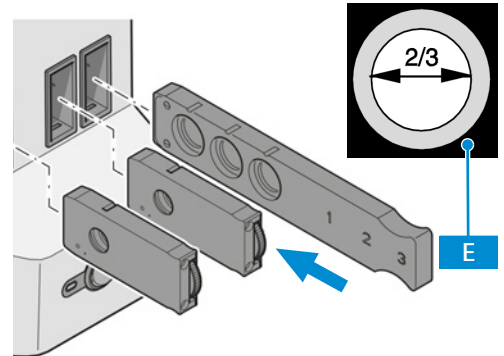




8. Open the luminous-field diaphragm until the edge of the diaphragm just disappears from the field of view **D**. Use the control wheel of luminous-field diaphragm slider.



9. Remove an eyepiece from the binocular tube to adjust the aperture diaphragm (contrast).  
 10. Look into the tube with the naked eye.  
 11. Set the aperture diaphragm to between  $\frac{2}{3}$  -  $\frac{4}{5}$  of the diameter of the exit pupil of the objective **E**. Use the control lever of aperture diaphragm slider.



12. Insert the eyepiece.  
 13. Adjust illumination intensity by turning the LM knob.



### Info

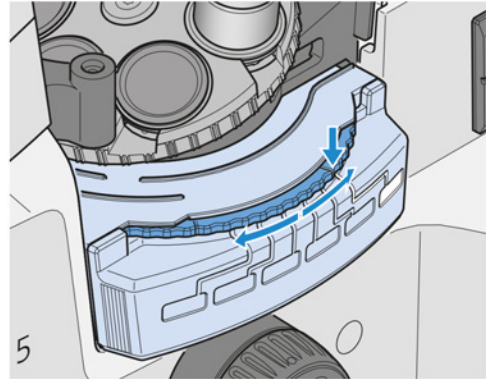
Never use the aperture diaphragm to adjust image brightness. Use the illumination intensity control for this purpose!

### 5.7.2 Setting Up for Reflected Light Darkfield Microscopy

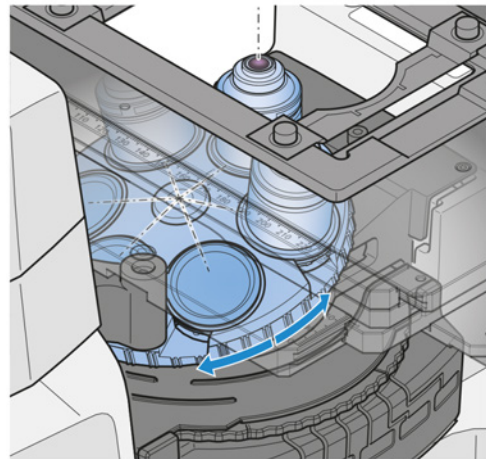
- Parts and Tools**
- 🔧 Reflector module darkfield ACR P&C for reflected light
  - 🔧 Objective for RL darkfield

- Prerequisite**
- ✓ The microscope is operational.
  - ✓ The illumination is adjusted for *reflected light brightfield microscopy* [[▶ 103](#)].

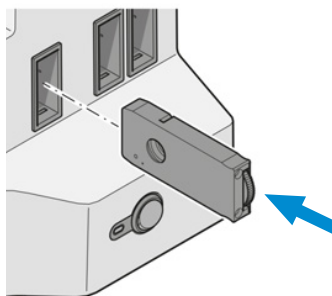
- Procedure**
1. Swivel the reflector module darkfield ACR P&C for reflected light on the reflector turret into the beam path.



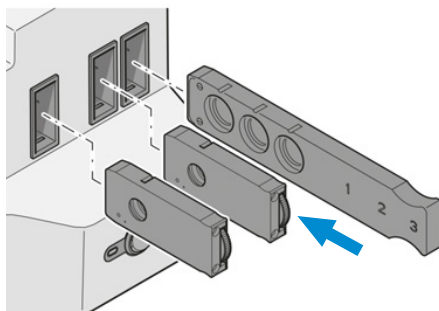
2. Bring the objective position with the darkfield objective into the beam path.



3. Completely open the luminous field diaphragm.







4. Completely open the aperture diaphragm.







5. Switch off or remove neutral filters if applicable.



### 5.7.3 Setting Up for Reflected Light Differential Interference Contrast Microscopy

**Parts and Tools**  Objective for DIC with compatible DIC slider and one of the following reflector modules:

**Parts and Tools**  Reflector module DIC/Pol ACR P&C shift free for reflected light  
 Reflector module DIC/Pol red I Lambda ACR P&C (to produce color contrasts)  
 Reflector module polarizer ACR P&C for reflected light  
 or

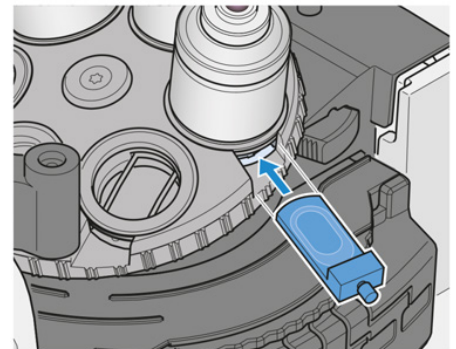
**Parts and Tools**  Polarizer Slider A 6x30 mm, 90° rotatable  
 Analyzer slider A 12x35 mm, 90° rotatable  
 or

**Parts and Tools**  Polarizer Slider A 6x30 mm, 90° rotatable  
 Reflector module with analyzer ACR P&C for reflected light

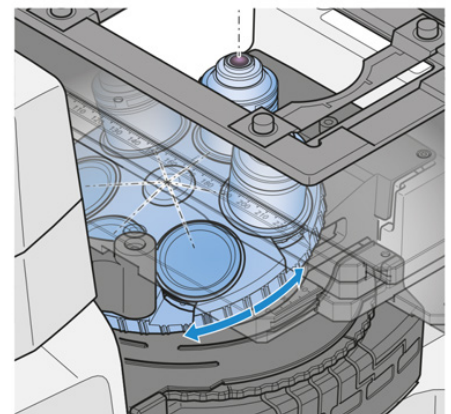
**Prerequisite**  The microscope is operational.  
 The illumination is adjusted for *reflected light brightfield microscopy* [[▶ 103](#)].

**Procedure**

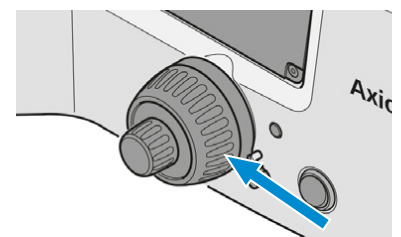
1. Swivel the reflector module DIC/Pol on the reflector turret into the beam path.
2. Slide the according DIC slider into the slot of the appropriate objective position.



3. Bring the objective for DIC into the beam path.



4. Place the sample on the stage.
5. Focus until the sample structure of interest appears.



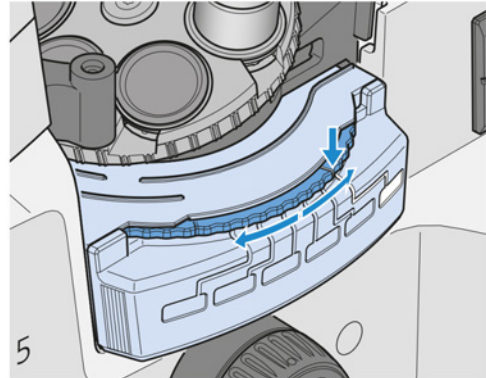
6. Use the knurled screw on the DIC slider to adjust the optimal contrast.

### 5.7.4 Setting Up for Reflected Light C-DIC Microscopy

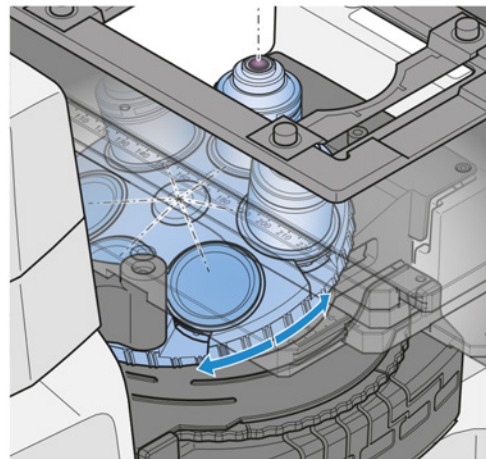
- Parts and Tools**
- 🔧 Objective for C-DIC with C-DIC slider 6x20
  - 🔧 Reflector module C-DIC/TIC ACR P&C for reflected light

- Prerequisite**
- ✓ The microscope is operational.
  - ✓ In the nosepiece, an EC Epiplan-Neofluar or EC Epiplan objective (marked DIC or Pol) is installed.
  - ✓ The illumination is adjusted for *reflected light brightfield microscopy* [[▶ 103](#)].

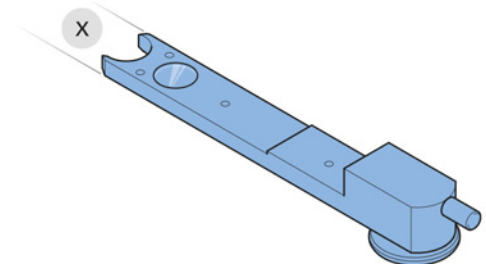
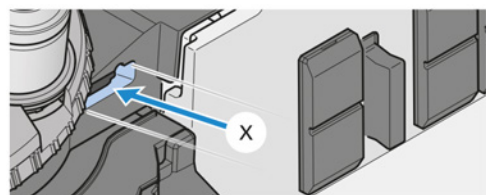
- Procedure**
1. Swivel the reflector module C-DIC/TIC ACR P&C for reflected light on the reflector turret into the beam path.



2. Swivel the C-DIC compatible objective into the beam path.

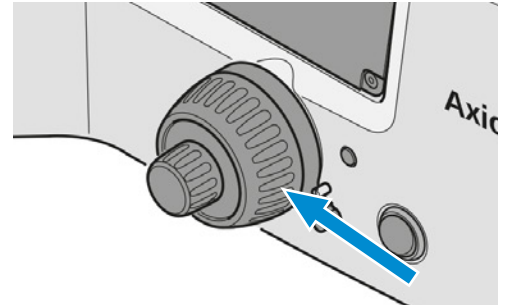


3. Insert the C-DIC slider 6x20 into the slot under the nosepiece.

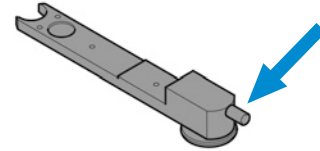


4. Place the sample on the stage.

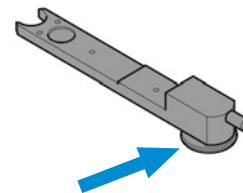
5. Focus until the sample structure of interest appears at maximum contrast.



6. Optimize the contrast by turning the setting screw on the C-DIC slider.



7. Turn the setting wheel on the C-DIC slider to align the structures vertically to the "light-shadow" direction and thus achieve maximum contrast.

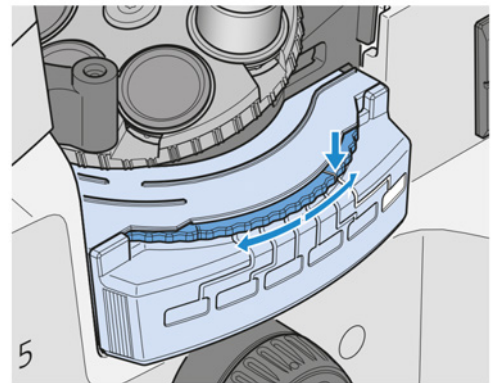


When using DIC or C-DIC, the contrast arises from a pseudo-relief in the object and therefore depends for linear structures on whether these structures are oriented in the "light-shadow" direction (very slight contrast) or vertically to it (maximum contrast). When using the C-DIC slider 6x20, the structures can be aligned vertically to the "light-shadow" direction by turning the adjusting wheel of the C-DIC slider. This achieves the maximum contrast.

### 5.7.5 Setting Up for Reflected Light TIC Microscopy

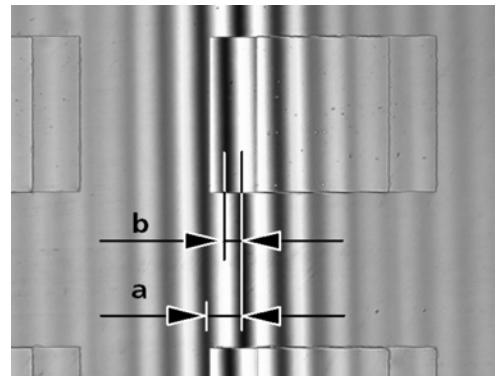
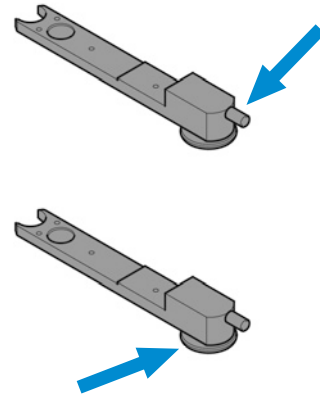
- Prerequisite**
- ✓ In the reflector turret, the reflector module C-DIC/TIC ACR P&C for reflected light is installed.
  - ✓ In the nosepiece, an EC Epiplan-Neofluar or EC Epiplan objective (marked DIC or Pol) is installed.
  - ✓ The TIC slider 6x20 (in combination with reflector module C-DIC/TIC P&C) is available.
  - ✓ The microscope is operational.

- Procedure**
1. Place the sample on the stage.
  2. Adjust the microscope for *reflected light brightfield* [▶ 103].
  3. Swivel the reflector module C-DIC/TIC P&C on the reflector turret into the beam path.



4. Insert the TIC slider 6x20 into the slot below the nosepiece.
  - Chromatic interference stripes appear in the field of view.

5. Move the black interference stripe by sight to the middle of the field of view. Use the setting screw on the TIC slider.
6. To choose the structure to be measured, turn the setting wheel on the TIC slider until the interference stripes are vertical to the direction in which the sample is broken down.
7. Determine the values for **a** (distance between the interference stripes) and **b** (offset of the interference stripes along the step) in the interference image. Use an eyepiece reticle micrometer or a micrometer eyepiece.



8. Perform the steps described in chapter *Reflected Light TIC Microscopy* [▶ 54].

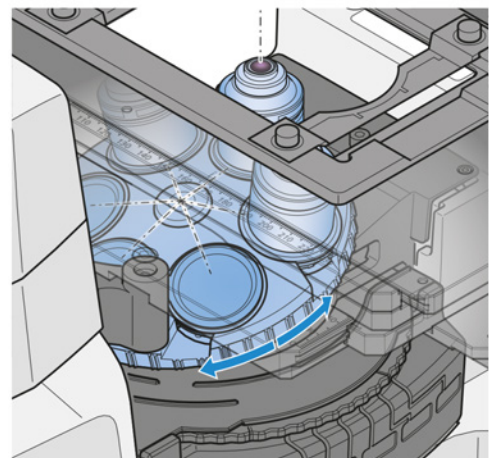
### 5.7.6 Setting Up for Reflected Light Polarization Contrast

**Parts and Tools** 🔧 Objective for Pol

#### 5.7.6.1 Setting Polarization with Reflector Module DIC/Pol ACR P&C

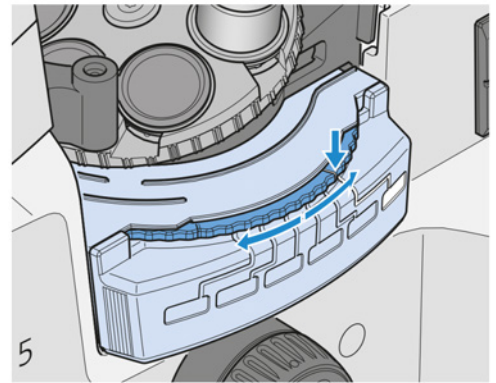
- Prerequisite**
- ✓ The microscope is operational.
  - ✓ In the reflector turret, the reflector module DIC/Pol ACR P&C is installed. Alternatively, the reflector module DIC/Pol red I Lambda ACR P&C can be used.
  - ✓ The illumination is adjusted for *reflected light brightfield microscopy* [▶ 103].

- Procedure**
1. Bring the Pol objective into the beam path.

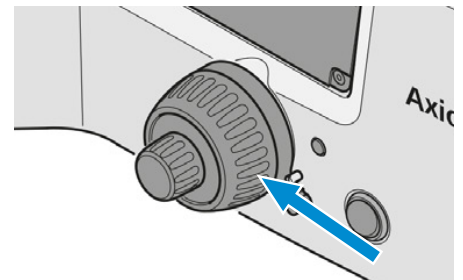


2. If applicable, remove the DIC slider.

3. Bring the reflector module DIC/Pol ACR P&C into the beam path.



4. Place the sample on the stage.
5. Focus the sample.

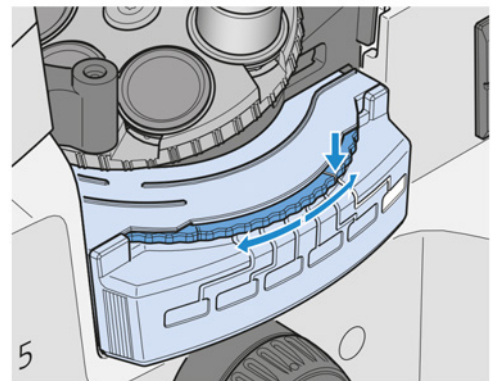


#### 5.7.6.2 Setting Polarization with Pol P&C Reflector Module and Analyzer Slider A

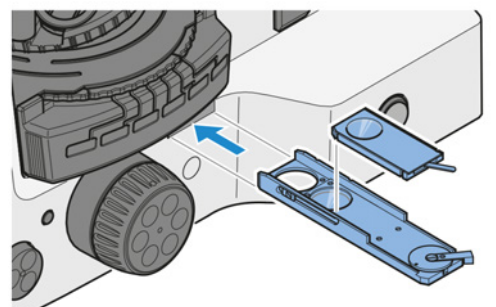
- Parts and Tools**
- 🔧 Reflector module polarizer ACR P&C
  - 🔧 Analyzer slider A 12x35 mm, 90° rotatable
  - 🔧 Compensator pol Lambda sub. +/- 10°

- Prerequisite**
- ✓ The microscope is operational.
  - ✓ The illumination is adjusted for *reflected light brightfield microscopy* [[▶ 103](#)].

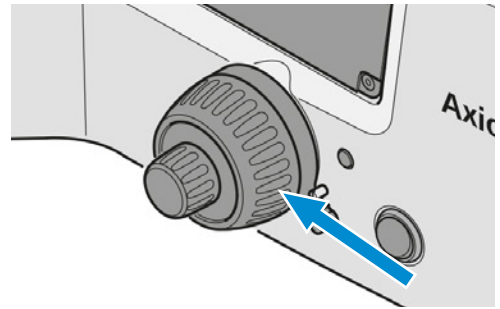
- Procedure**
1. Bring the reflector module polarizer ACR P&C into the beam path.



2. Slide the analyzer slider A 12x35 mm, 90° rotatable into the slot under the reflector turret. The analyzer slider may be inserted both from the left-hand and right-hand sides.



3. Using the analyzer turning lever, cross the vibration directions of the analyzer and the polarizer.
4. Place the sample on the stage.
5. Focus the sample.

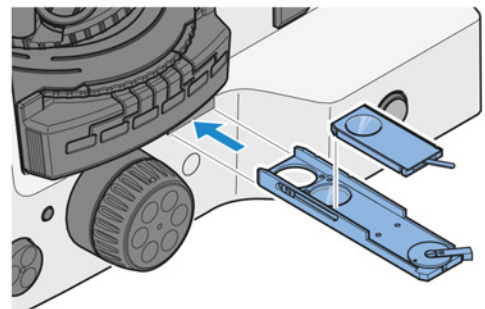


### 5.7.6.3 Setting Polarization with the Analyzer Slider A and Polarizer Slider A

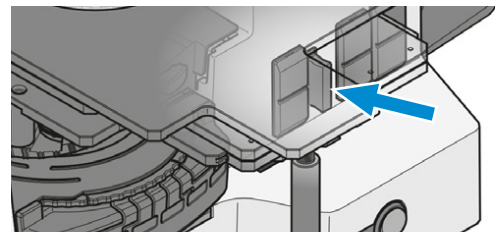
- Parts and Tools**
- 🔧 Analyzer slider A 12x35 mm, 90° rotatable
  - 🔧 Polarizer Slider A 6x30 mm, 90° rotatable

- Prerequisite**
- ✓ The microscope is operational.
  - ✓ The illumination is adjusted for *reflected light brightfield microscopy* [▶ 103].

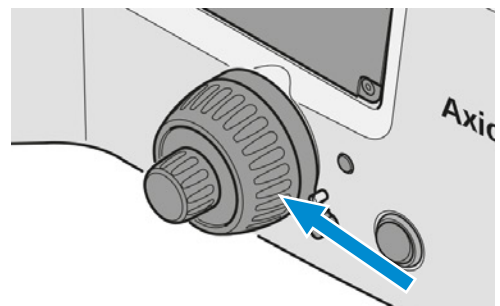
- Procedure**
1. Slide the analyzer slider A 12x35 mm, 90° rotatable into the slot under the reflector turret. The analyzer slider may be inserted both from the left-hand and right-hand sides.



2. Slide the polarizer slider A into slot P.



3. Using the analyzer turning lever, cross the vibration directions of the analyzer and the polarizer.
4. Place the sample on the stage.
5. Focus the sample.





### 5.7.7 Setting Up for Reflected Light Fluorescence Microscopy

The present section applies to the following microscope type:

- Axiovert 5 TL FL SCB

#### **⚠ CAUTION**

##### **Eye damage due to LED and UV radiation**

The applicable fluorescent light sources are LED Risk Group 2 or 3 (depending on the light sources) as specified in IEC 62471 and emit LED radiation and UV radiation. Although it would be reduced to Risk Group 1 level by lens, objectives and other optical instruments, it is always highly recommended:

- ▶ Never look into the LED beam of the illuminating device – either with or without optical instruments.
- ▶ Always use the fluorescence protection shield in fluorescence applications. Failure to comply with this warning may result in eye injuries!

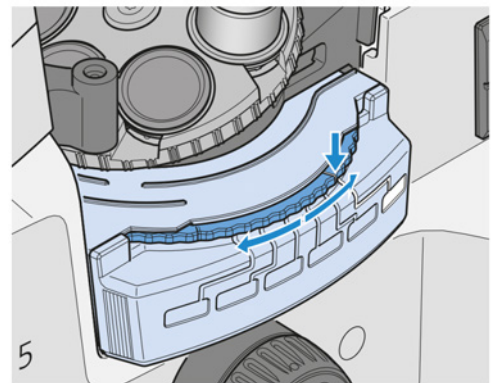
#### **Info**

The adjustment of reflected light fluorescence is facilitated by starting with an objective of average magnification and a sample of high fluorescence. Demonstration samples can also be used for the start-up.

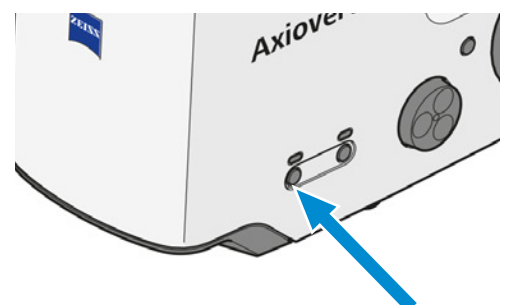
- Parts and Tools**
- 🔧 Reflector Module FL EC P&C with assembled fluorescence filter set
  - 🔧 Slider 14x40 FL attenuator, discrete
  - 🔧 Hex key, 1.5 mm

- Prerequisite**
- ✓ The microscope is operational.
  - ✓ The microscope is adjusted for *reflected light brightfield microscopy* [▶ 103].
  - ✓ The Colibri 3 LED light source is *installed* [▶ 81].

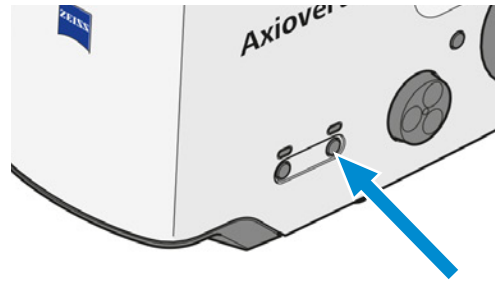
- Procedure**
1. Turn the reflector turret to the empty position for transmitted light brightfield.



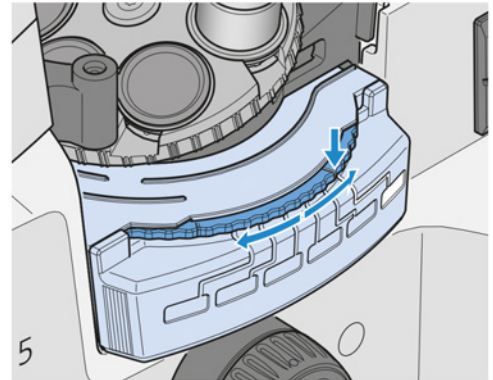
2. Seek the sample detail to be examined.
3. Switch off the transmitted light illumination.



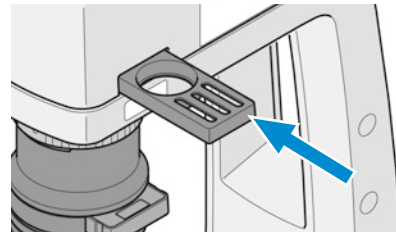
- Switch on the Colibri 3 LED light source.



- Select the LED module of the Colibri 3 LED light source by short press on the **Light intensity/LM button**. Repeated short pressing switches a single LED or all LEDs of the Colibri 3 LED light source together on or off.
- Bring the reflector module FL EC P&C into the light path.

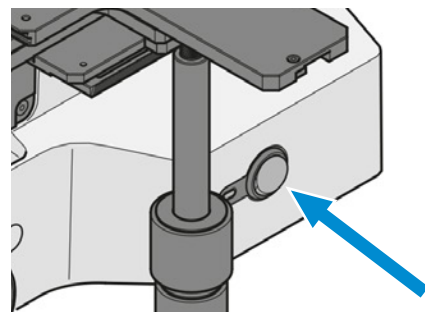


- NOTICE** To suppress the phosphorescence of the TL light source, it is necessary to use the phosphorescence blocking filter. Bring the phosphorescence blocking filter in the beam path.



## 5.8 Switching Off the Microscope

- Procedure**
- Set the **Power** switch to position **O**.



- Cover the microscope with the dust cover.

## 5.9 Operating the Microscope via the On Screen Display (OSD) Menu

The OSD menu opens, when the following *connections are made* [▶ 57]:

- The camera is connected to the SCB via a short camera cable (only Axiocam 305).
- The monitor is connected to the SCB via HDMI cable.
- The USB stick for data storage is adapted to the SCB.
- Keyboard and Mouse are connected to the SCB via USB 2.0 type A.
- The camera is connected to the mains (only Axiocam 20X).

### 5.9.1 Configure Microscope Menu

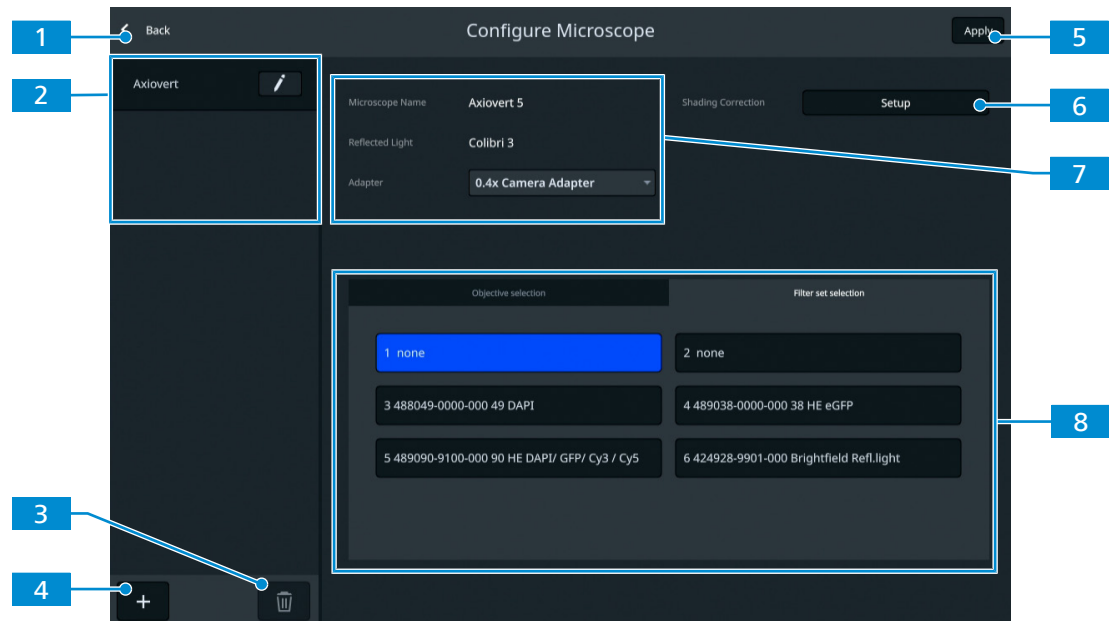


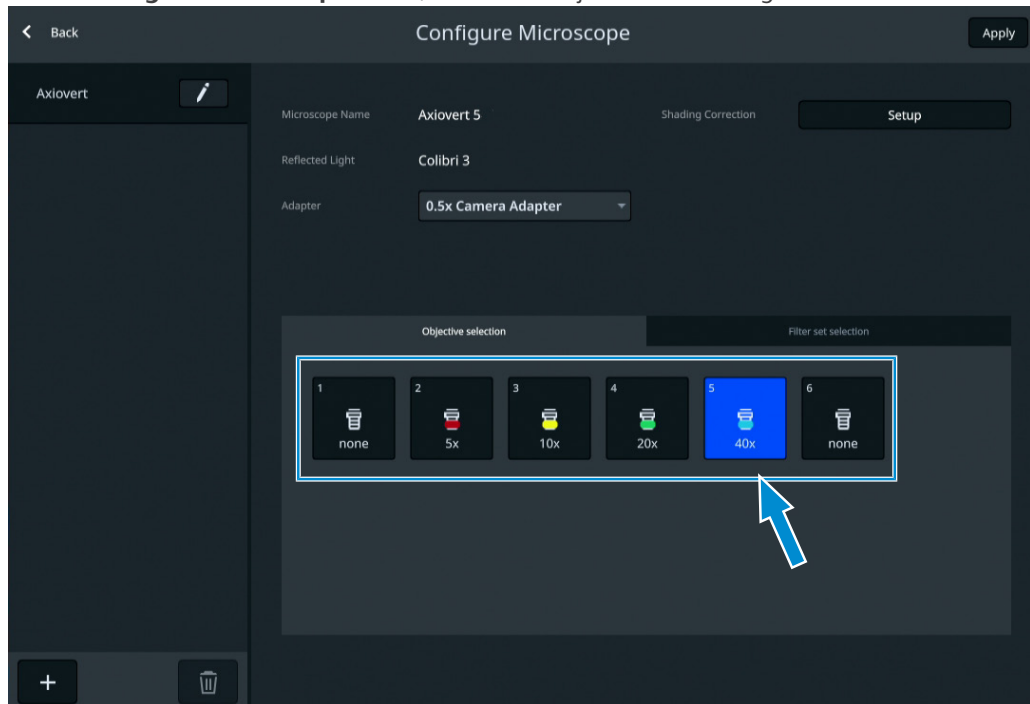
Fig. 46: *Configure Microscope* menu

No.	Parameter	Description
1	<b>Back</b> button	Close the menu.
2	Configuration list	The microscope and the camera are recognized automatically.
3	<b>Delete</b> button	Delete the selected microscope configuration from the list.
4	<b>Add</b> button	Perform auto configuration to add the new microscope configuration to the list.
5	<b>Apply</b> button	Apply the changes.
6	<b>Setup</b> button	<i>Open the Shading Correction Setup submenu [▶ 118].</i>
7	Microscope configuration area	Configure the microscope.
8	Objective selection/Filter set selection area	<i>Select the objective and the filter set [▶ 116].</i>

### 5.9.1.1 Assigning Objectives and Filter Sets

**Prerequisite** ✓ The microscope is operational.

**Procedure** 1. In the **Configure Microscope** menu, select the objective to be assigned.



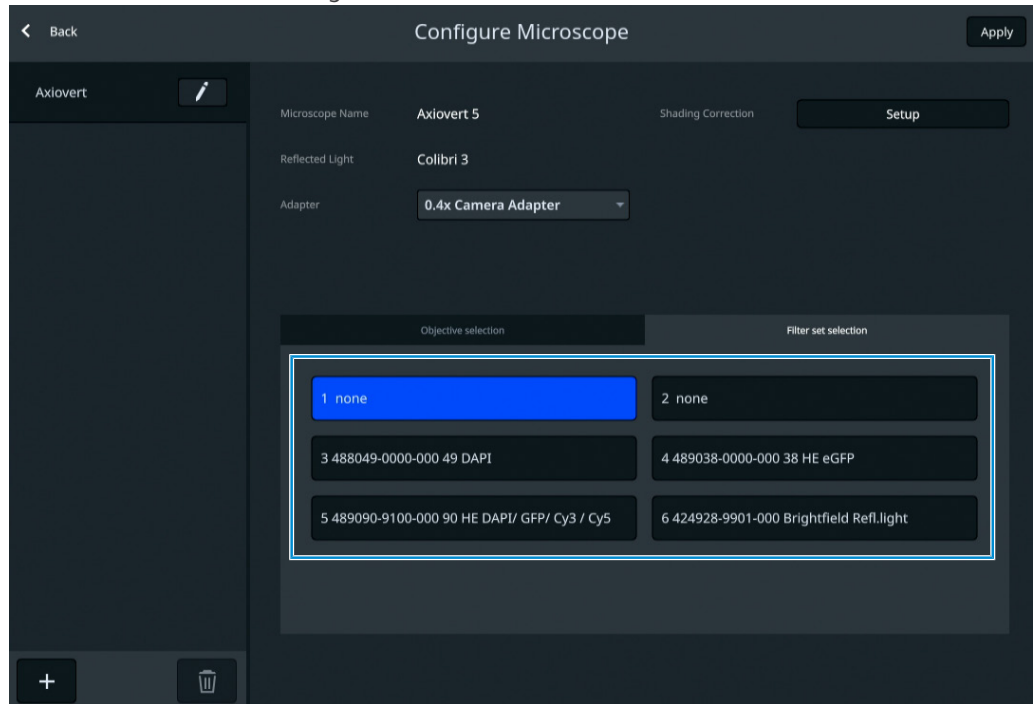
→ The **Objective** submenu opens.

2. Select one of the available objectives from the list.
3. Click **Save** to apply the selection.



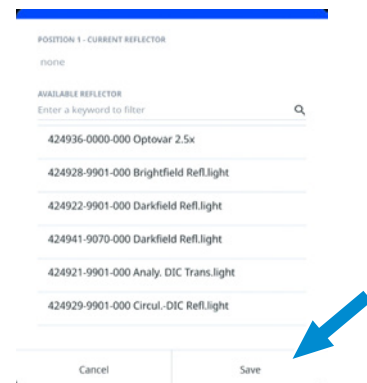
4. Repeat the procedure for other objective positions, if required.
5. Click on the **Filter set selection** tab.

6. Select the filter set to be assigned.



→ The **Filter set selection** submenu opens.

7. Select one of the available reflector modules from the list.
8. Click **Save** to apply the selection



9. Repeat the procedure for other filter set positions, if required.
10. Click **Apply** to save the selection.
11. Click **< Back** to return to the live image.

### 5.9.1.2 Performing a Shading Correction

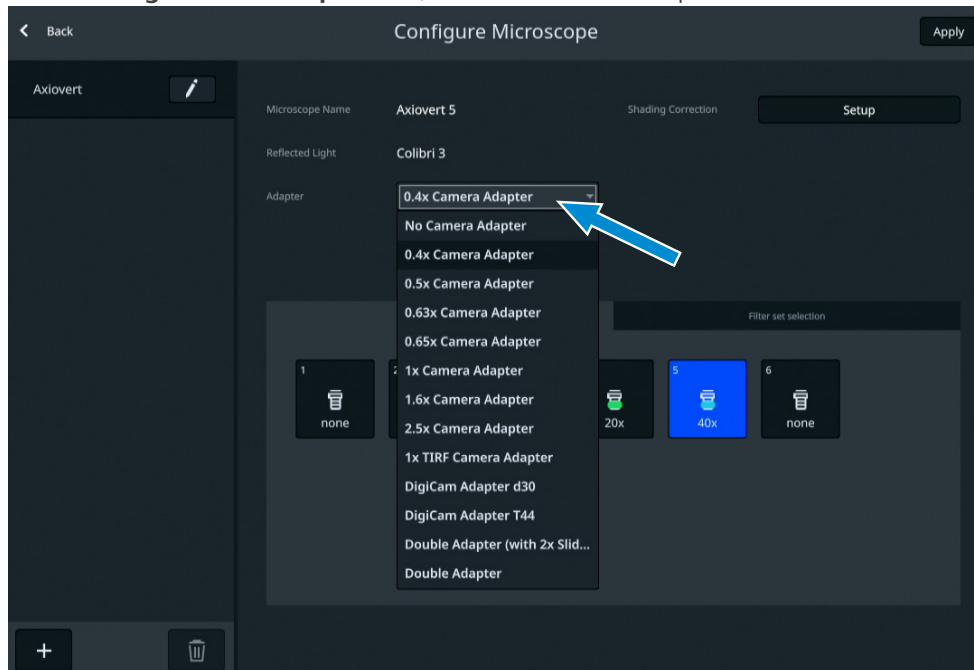
#### Info

#### Insufficient image quality after changing the configuration of the microscope.

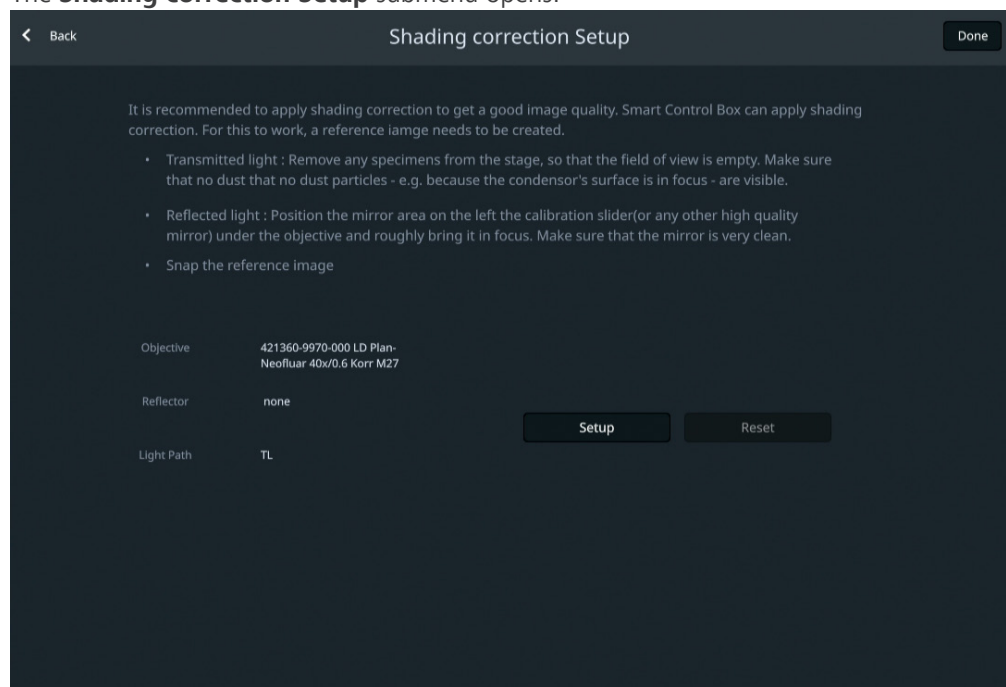
It is recommended to perform a shading correction for each objective of any newly configured microscope before starting to work.

**Prerequisite** ✓ The microscope is operational.

**Procedure** 1. In the **Configure Microscope** menu, select the camera adapter.



2. Click on the **Setup** button.  
→ The **Shading correction Setup** submenu opens.



3. Read and observe the on-screen hints on how to perform an individual shading correction.  
4. Click on the **Setup** button.

### 5.9.2 Live View Menu

The **Live view** menu gives you basic imaging controls to capture your images with minimum amount of effort.

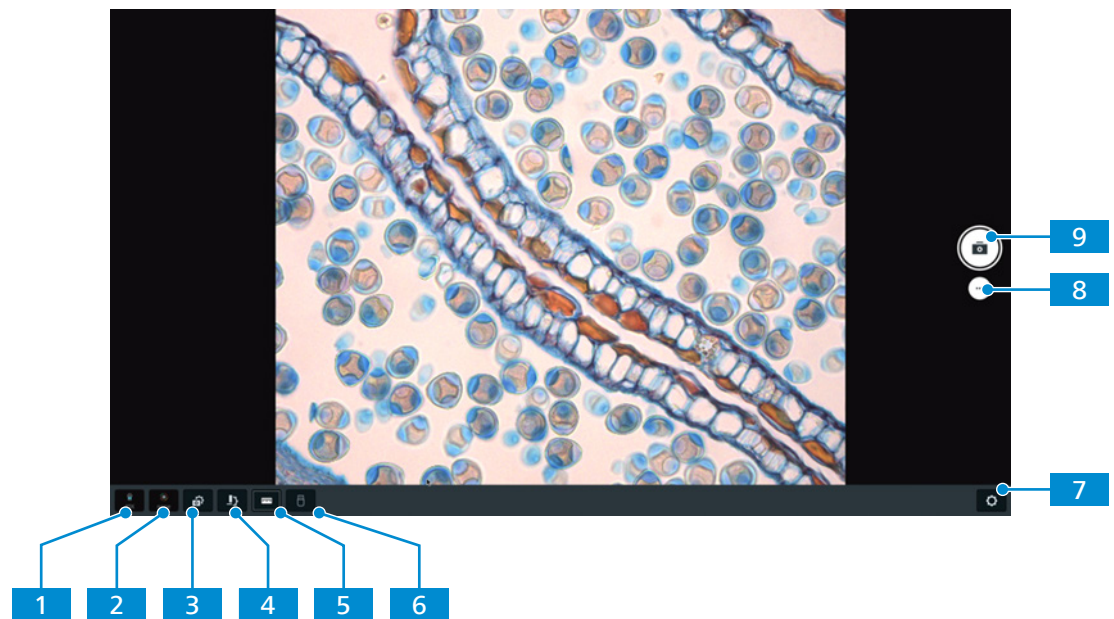


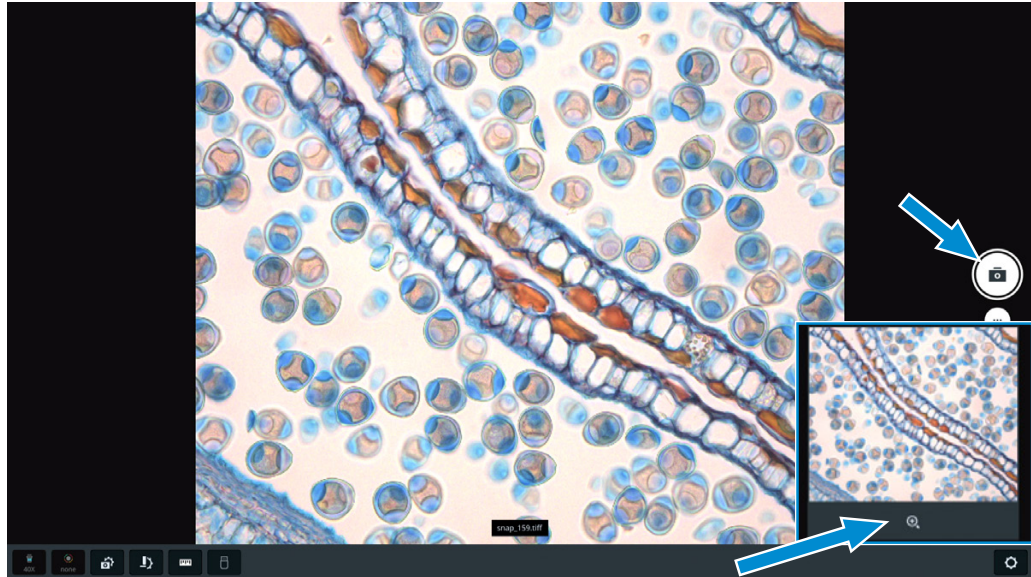
Fig. 47: Home menu

No.	Parameter	Description
1	<b>Objective</b> icon	The currently used objective is displayed.
2	<b>Reflector</b> icon	The currently used reflector is displayed.
3	<b>Acquisition settings</b> icon	Opens the acquisition settings menu, see <i>Acquisition Settings Menu</i> [▶ 123].
4	<b>Microscope settings</b> icon	Opens the microscope settings menu, see <i>Configure Microscope Menu</i> [▶ 115].
5	<b>Scale bar</b> icon	Allows to add a scale bar to the image.
6	<b>USB stick</b> icon	Shows if a USB stick is connected.
7	<b>Global settings</b> icon	Opens the global settings menu, see <i>Global Settings Menu</i> [▶ 126].
8	<b>Change acquisition mode</b> icon	Select the desired acquisition mode, see <i>Acquisition Modes</i> [▶ 123].
9	<b>Snap</b> button	Snaps a single image. Depending on the selected acquisition mode different types of acquisition can be performed.

### 5.9.2.1 Acquiring a Single Image

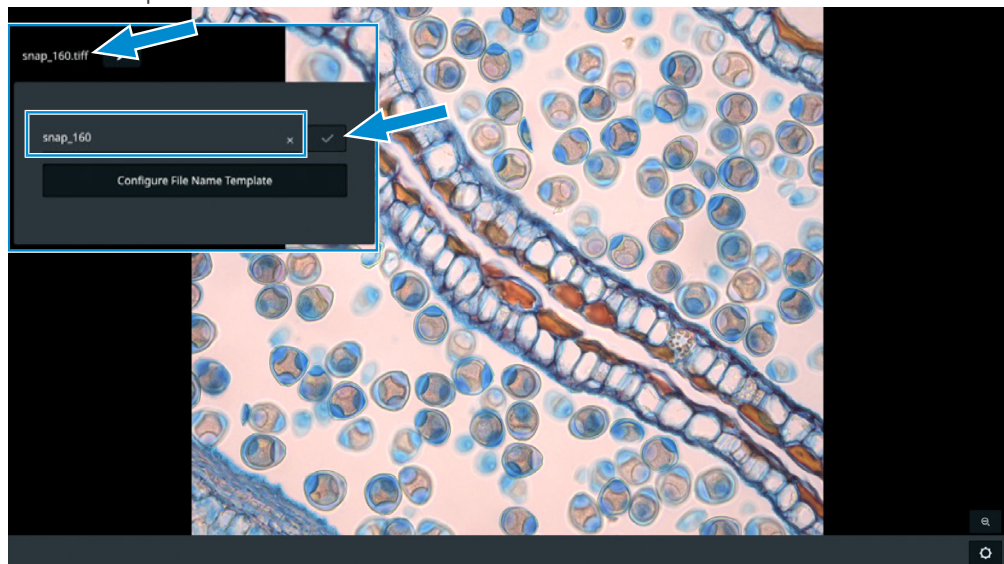
- Prerequisite**
- ✓ The microscope is operational.
  - ✓ The Single Image (Snap) acquisition mode is active.


- Procedure**
1. Click on the **Snap** button.
    - A single image is captured and a preview is displayed on the bottom right side of the screen.
  2. Click on the preview.



→ The image opens and is displayed enlarged.

3. Click on the image name.
  - A window opens in which the file name can be entered.



4. Enter a new name for the image.
5. Click on the button  to save the changes.

#### Info

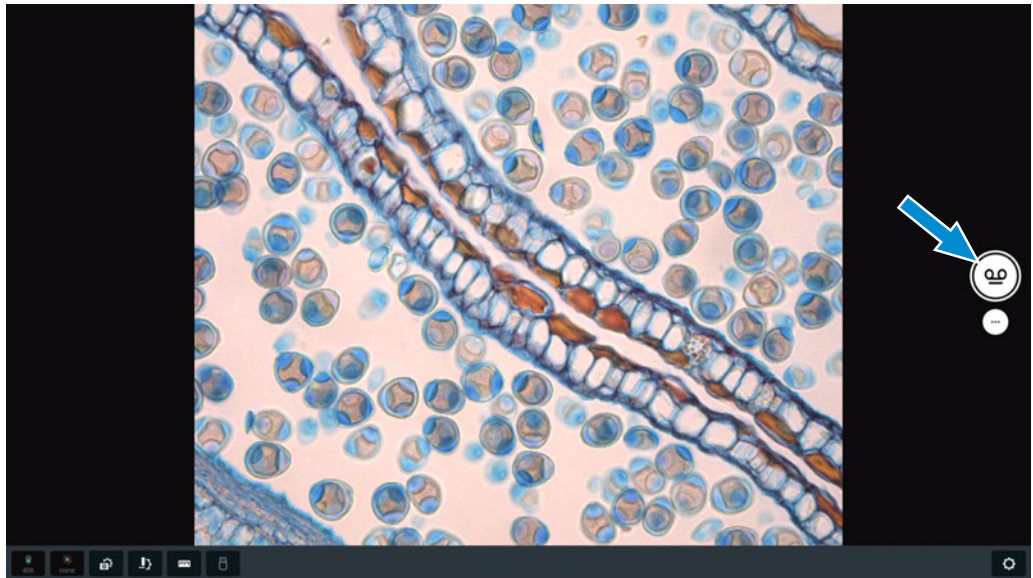
The **Configure File Name Template button** opens another template in which presettings for naming the files can be made.




### 5.9.2.2 Recording a Video

- Prerequisite**
- ✓ The microscope is operational.
  - ✓ The Video Recording acquisition mode is active.

- Procedure**
1. Click on the **Video** button.



→ The video recording starts.

→ The button changes to .

2. Click on .

→ The video recording stops.

→ The recorded video is displayed on the bottom right corner of the screen.

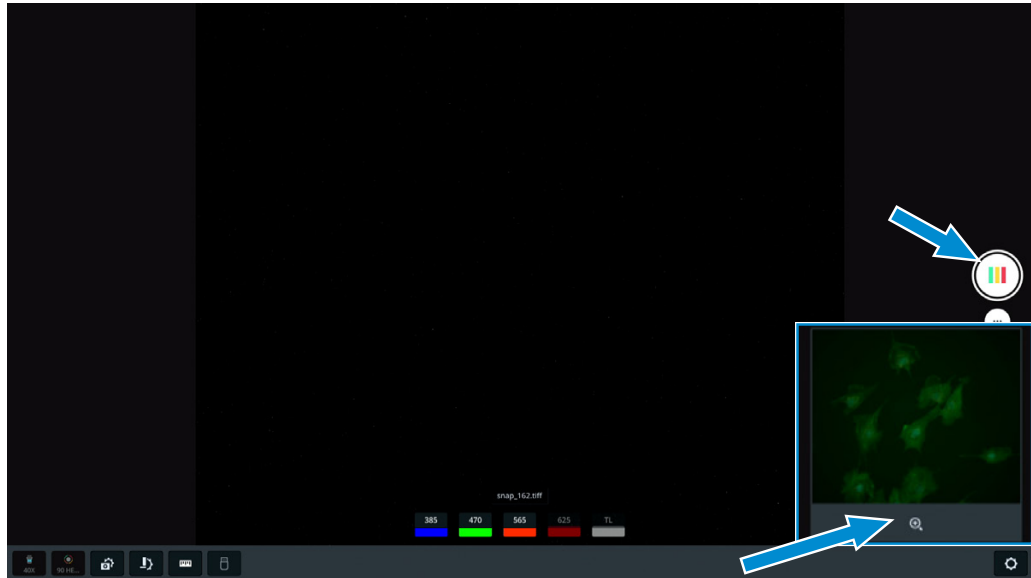
### 5.9.2.3 Acquiring Multi-Channel Images

- Prerequisite**
- ✓ The microscope is operational.
  - ✓ The Multi-Channel acquisition mode is active.

- Procedure**
1. Click on the desired **fluorescence channel** button.
- A live image is displayed on the screen.

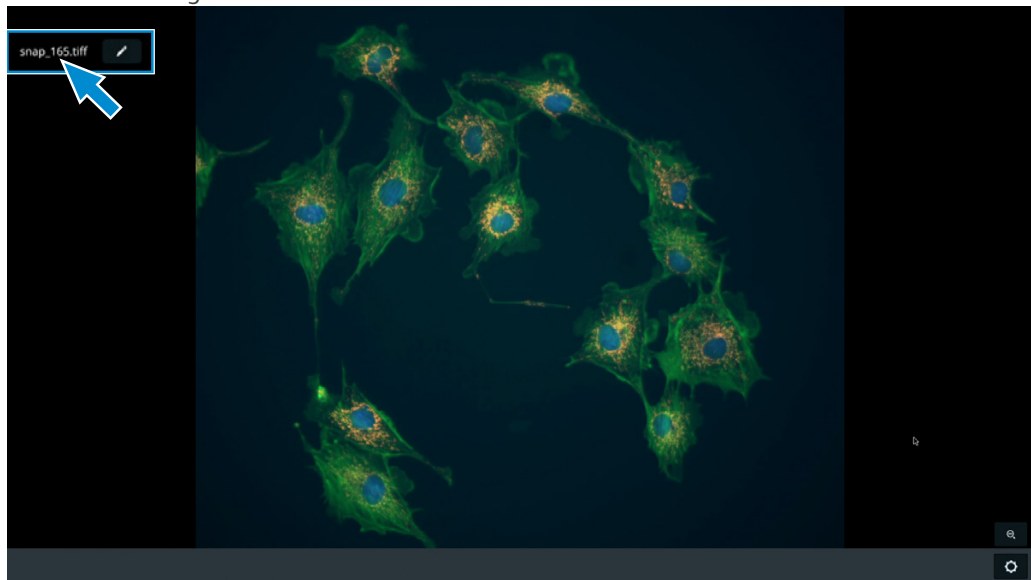


2. If necessary, optimize the acquisition settings.
3. Click the **right mouse button** to select the desired fluorescence channels for the MCF image. Channels with a gray background are not taken into account in the MCF recording.
4. Repeat the procedure for other channels.
5. Click on the **Multi-Channel** button.
  - The multi-channel image is saved and a preview displayed on the bottom right side of the screen.
6. Click on the preview.




→ The image opens.

7. Click on the image name.






→ A window opens in which the file name can be entered.

8. Enter a new name for the image.
9. Click on the button  to save the changes.

### 5.9.3 Acquisition Modes

The following acquisition modes are available:

Icon	Mode
	Single image acquisition (Snap) [ <a href="#">▶ 120</a> ]
	Video recording [ <a href="#">▶ 121</a> ]
	Multi-channel acquisition [ <a href="#">▶ 121</a> ]

### 5.9.4 Acquisition Settings Menu

Based on the camera type and the microscope, the content of the **Acquisition Settings** menu may vary. The **Acquisition Settings** menu contains two layers, which can be selected by clicking the corresponding tab:

- **Basic**
- **Advanced**

#### 5.9.4.1 Acquisition Settings Menu - Basic

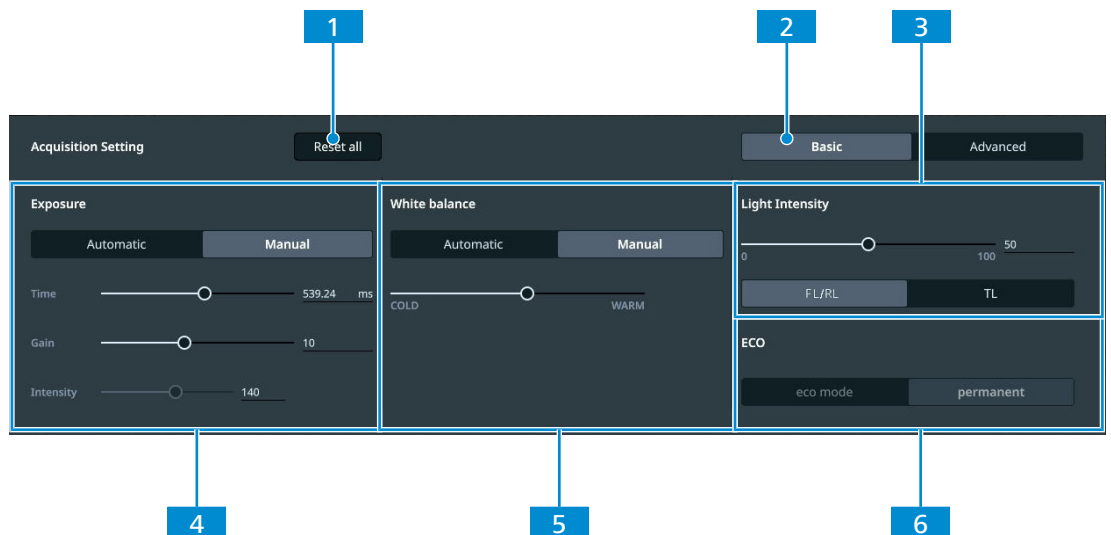


Fig. 48: **Acquisition Settings** menu - Basic

No.	Parameter	Description
1	<b>Reset all</b> button	Restore the default settings.
2	<b>Basic</b> tab	Open the <b>Basic</b> layer
3	<b>Light intensity</b> controls	Set the light intensity [ <a href="#">▶ 125</a> ].
4	<b>Exposure</b> controls	Set the exposure [ <a href="#">▶ 124</a> ].
5	<b>White balance</b> controls	Set the white balance [ <a href="#">▶ 126</a> ].
6	<b>ECO</b> indicator	Check the ECO mode setting.

### 5.9.4.2 Acquisition Settings Menu - Advanced

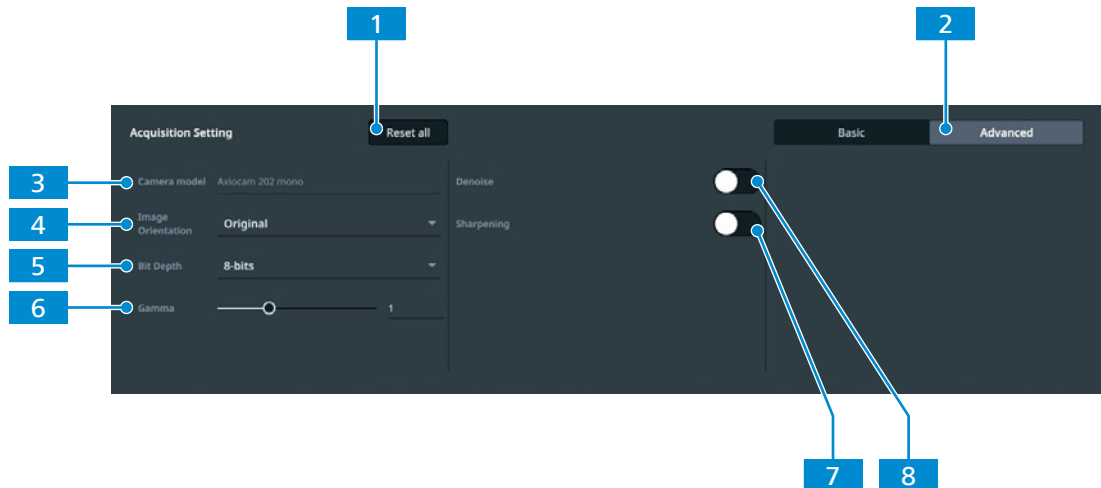


Fig. 49: Acquisition Settings menu - Advanced

No.	Parameter	Description
1	Reset all button	Restore the default settings.
2	Advanced tab	Open the <b>Advanced</b> layer.
3	Camera model display field	Displays the camera model.
4	Image orientation drop down list	Adjust the image orientation.
5	Bit depth drop down list	Select the bit depth.
6	Gamma slider	Adjust the gamma settings.
7	Sharpening switch	Activate/deactivate automatic sharpening.
8	Denoise switch	Activate/deactivate automatic denoising.

### 5.9.4.3 Setting the Exposure

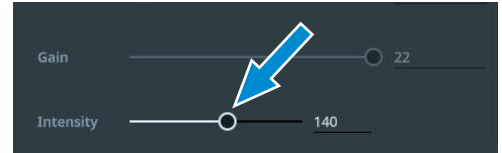
#### Automatically setting the exposure

The automatic exposure setting mode ensures a consistent brightness of the image by continuously calculating the correct exposure time based on the current light intensity.

- Procedure**
1. At the OSD menu, navigate to the **Acquisition Settings** menu.
  2. At the **Exposure** controls, click the **Automatic** button.



3. If necessary, fine-tune the exposure **Intensity** using the respective **slider** or the input field.

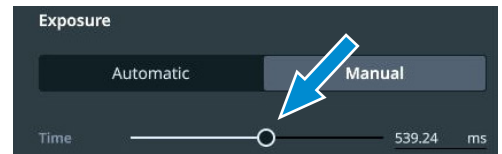


### Manually setting the exposure

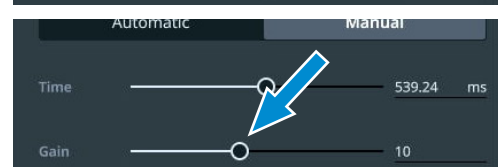
- Procedure**
1. At the OSD menu, navigate to the **Acquisition Settings** menu.
  2. At the **Exposure** controls, click the **Manual** button.



3. Set the exposure **Time** using the respective **slider** or the input field.

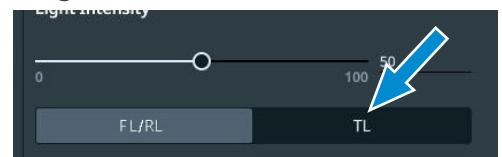


4. Set the **Gain** value using the respective **slider** or input field.



#### 5.9.4.4 Setting the Light Intensity

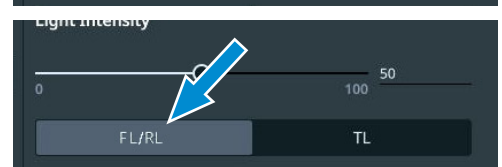
- Procedure**
1. At the OSD menu, navigate to the **Acquisition Settings** menu.
  2. At the **Light intensity** controls, tap the **TL** button, if a TL light source is installed.



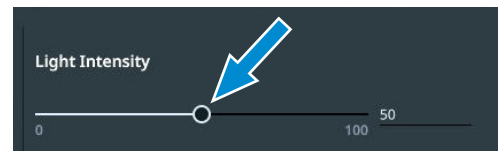
3. If necessary, fine-tune the **Light Intensity** for the TL light source using the respective **slider** or the input field.



4. Tap the **FL/RL** button, if a RL or FL light source is installed.

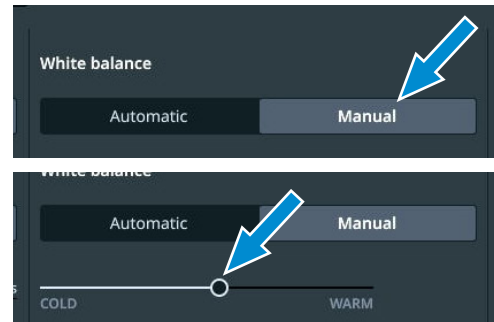


5. If necessary, fine-tune the **Light Intensity** for the RL light source using the respective **slider** or the input field.



### 5.9.4.5 Manually Setting the White Balance

- Procedure**
1. At the OSD menu, navigate to the **Acquisition Settings** menu.
  2. At the **White balance** controls, click the **Manual** button.
  3. If necessary, fine-tune the white balance using the **slider**.



### 5.9.5 Global Settings Menu

The **Global Settings** menu contains four layers, which can be selected by clicking the corresponding tab:

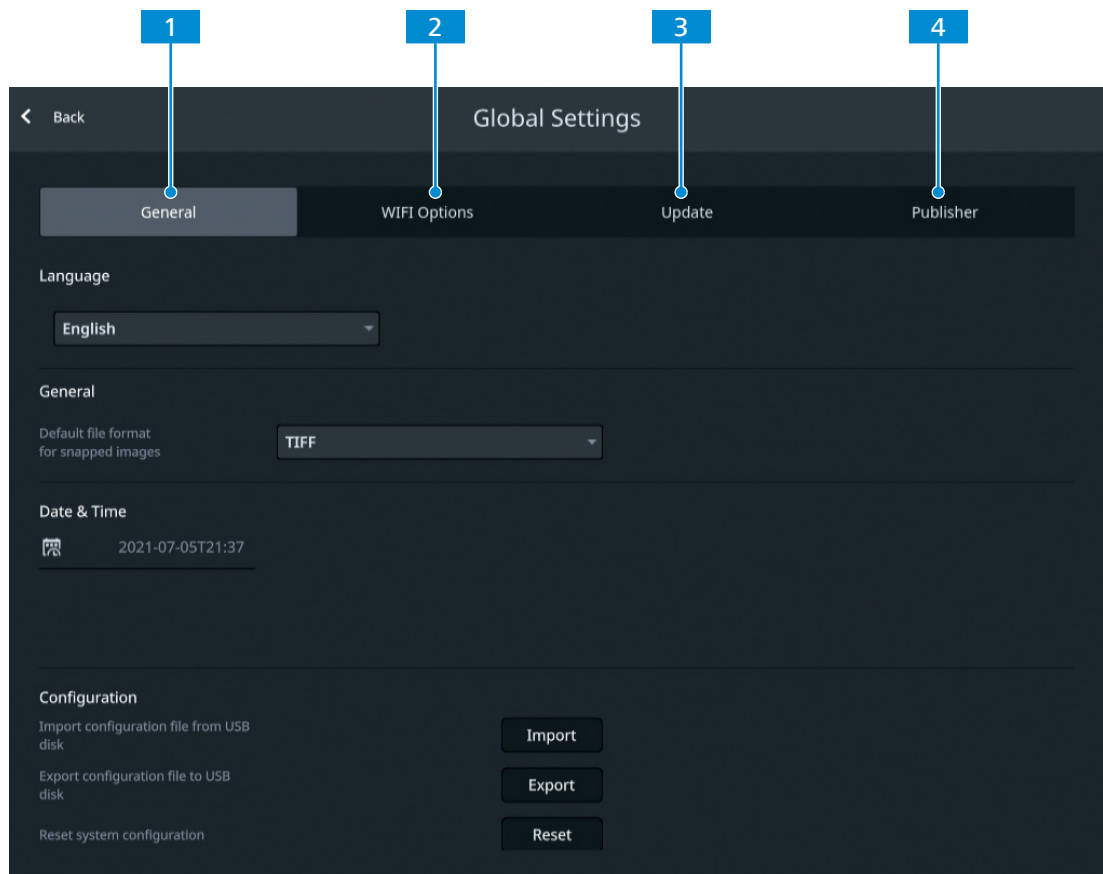


Fig. 50: **Global Settings** menu

**1** General Tab [[▶ 127](#)]

**2** Wi-Fi Options Tab

**3** Update Tab [[▶ 128](#)]

**4** Publisher Tab [[▶ 128](#)]

### 5.9.5.1 General Tab

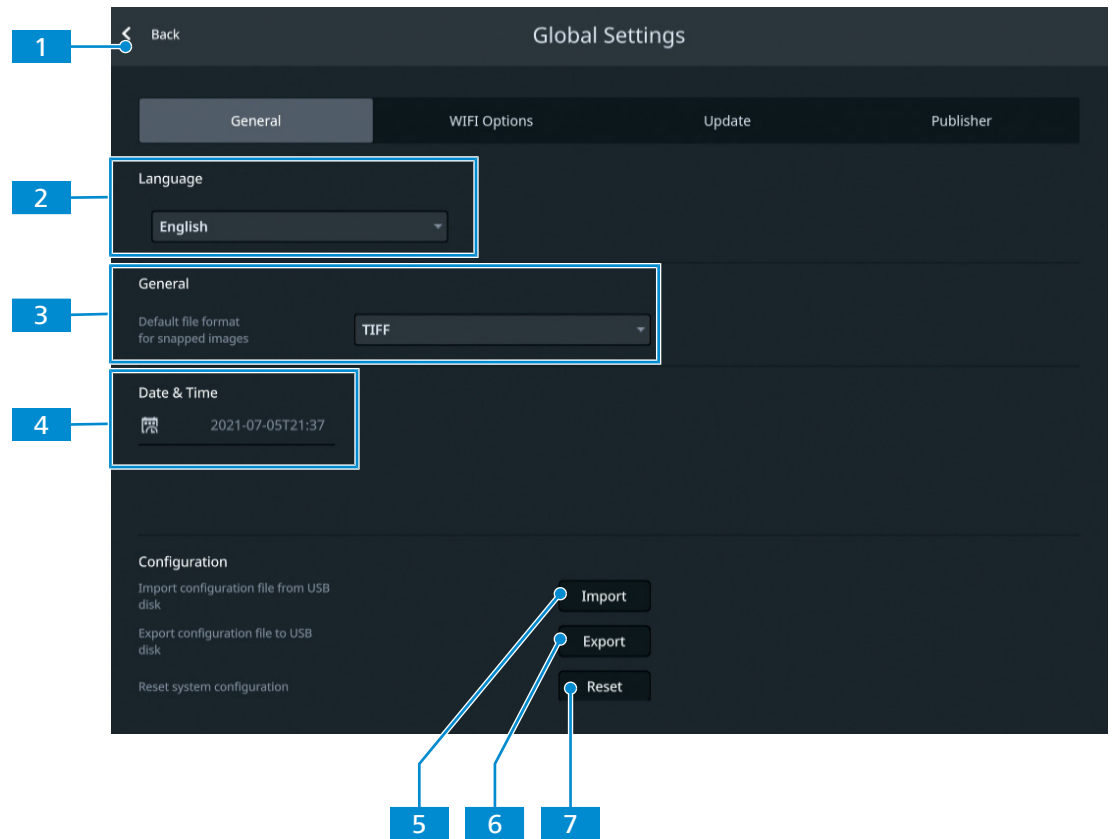


Fig. 51: *Global Settings* menu, *General* tab

No.	Parameter	Description
1	<b>Back</b> button	Close the menu.
2	<b>Language selection</b> drop down menu	Select the language of the application.
3	<b>Default file format</b> drop down menu	Select the default file format for the generated images.
4	<b>Date &amp; Time</b> setting field	Set date and time.
5	<b>Import</b> button	Import an existing configuration file.
6	<b>Export</b> button	Export the configuration file.
7	<b>Reset</b> button	Reset the system configuration.

### 5.9.5.2 Update Tab

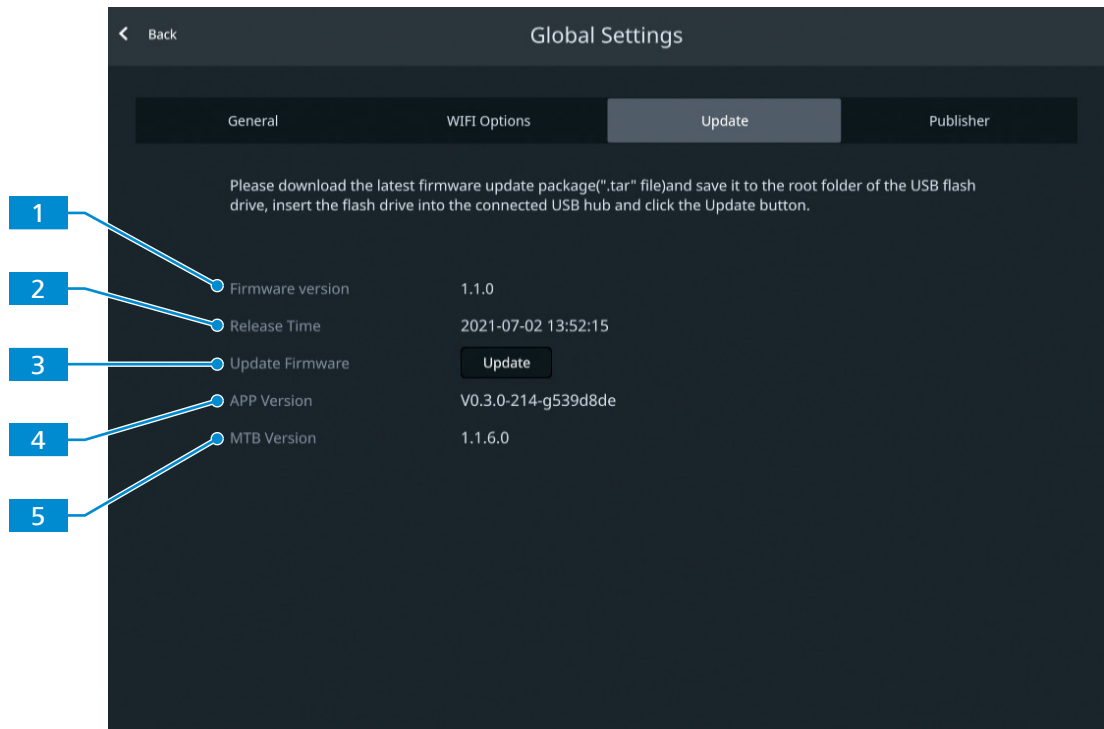


Fig. 52: *Global Settings* menu, *Update* tab

No.	Parameter	Description
1	Firmware version	The version of the installed firmware is displayed.
2	Release Time	The release date and time of the installed firmware is displayed.
3	<b>Update</b> button	Start a firmware update.
4	APP Version	The version of the installed APP software is displayed.
5	MTB Version	The version of the installed MTB software is displayed.

### 5.9.5.3 Publisher Tab

The **Publisher** tab displays legal information regarding the publisher as well as links to the user support forum, data protection notice, and end user license agreement.



## 6 Care and Maintenance

To ensure the best possible performance of the microscope, maintenance must be performed on a regular basis. Please keep the service logs for your microscope.

To maintain operational safety and reliability of the microscope, we recommend entering into a **ZEISS Protect Service Agreement**.

### Info

For additional information and detailed descriptions, refer to further applicable documents or ask your ZEISS Sales & Service Partner.

### 6.1 Safety During Cleaning and Maintenance

Only conduct preventive measures described here. All tasks of maintenance and cleaning not described may only be performed by an authorized ZEISS service representative.

Any unauthorized intervention or any operation outside the scope of the intended use can lead to injuries and property damage and voids all rights to warranty claims. Only original spare parts from ZEISS may be used.

### NOTICE

#### Property damage due to short circuit

When the microscope is still switched on, coming in contact with electronic parts can lead to a short circuit.

- ▶ Switch off the microscope prior to opening or cleaning.
- ▶ Disconnect live parts from the power supply.

### NOTICE

#### Functional impairment due to dirt and moisture

Dirt, dust and moisture can impair the microscope functionality and can cause short-circuits.

- ▶ Use the dust protection cover if the microscope is not used.
- ▶ The ventilation slots must be unobstructed at all times.
- ▶ Perform regular maintenance and cleaning according to the instructions in this document and according to the instructions in the applicable documents.
- ▶ Make sure that no cleaning liquid or moisture gets inside the microscope.
- ▶ In case of damage, the affected parts of the microscope must be taken out of operation.

## 6.2 Maintenance Schedule

The recommended intervals for maintenance depend on the total uptime of the microscope.

Interval	Part/Component	Activity
daily	Axiovert 5/7	Check the power cable and the plug for possible damage.  If any damage is observed, turn the instrument off and secure it against inadvertent restarts immediately. Call in a qualified professional to remedy the problem.
If the bulb is defective or used up.	HAL 100 light source	<i>Replace the bulb [▶ 160]. Adjust the HAL 100 light source [▶ 159].</i>
If LED modules are defective or used up	Colibri 3 LED light source	<i>Replace the LED modules [▶ 132].</i>
	TL light source	<i>Replace the light source [▶ 133].</i>
	RL light source	<i>Replace the light source [▶ 79].</i>
If the travel range in X direction will gradually become smaller	Scanning stage	<i>Recover the stage travel range [▶ 131].</i>

Tab. 3: Maintenance Plan





## 6.3 Maintenance Work

### 6.3.1 Cleaning an Optical Surface

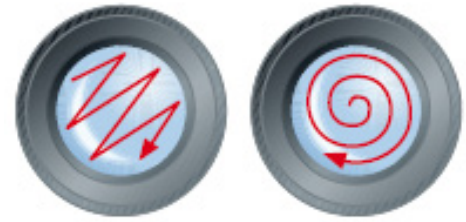
#### NOTICE

##### Damage of optical surfaces due to improper cleaning

- ▶ Remove dust from the optical surface slowly and carefully.
- ▶ Remove dust on optical surfaces with a natural-hair brush or blow it off with a rubber bellows.
- ▶ Avoid touching optical surfaces with fingers.

- Parts and Tools**
-  Clean cloth
  -  Cotton swab
  -  Optical cleaning solution (85% n-hexan and 15 vol% isopropyl alcohol (IPA))
  -  Lint-free cloth

- Procedure**
1. Moisten a cotton swab or a clean cloth with an optical cleaning solution, if necessary.
  2. Wipe optical surfaces in a circular motion towards the edge of the optics with slight pressure.



WRONG

CORRECT

3. Dry with a lint-free cloth.

### 6.3.2 Removing Water-Soluble Contamination

- Parts and Tools**
-  Clean cloth
  -  Lint-free cloth

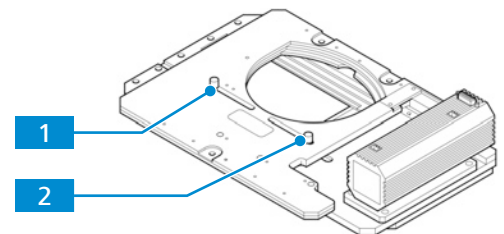
- Procedure**
1. Moisten a clean cloth with water.  
→ A mild detergent may be added to the water (no solvent!).
  2. Wipe off the area with the cloth.
  3. Dry with a lint-free cloth.

### 6.3.3 Adjusting the Travel Range of the Scanning Stage 130x85 mot P; CAN

- Parts and Tools**  Hex key, 1.5 mm

#### Limiting the range for X direction movements

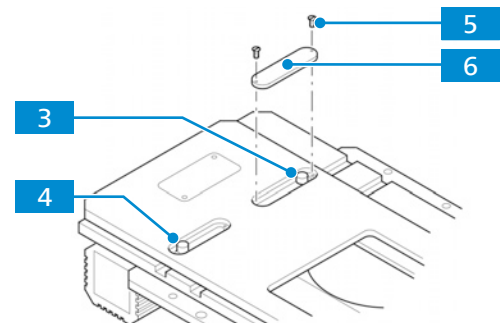
- Procedure**
1. At the stage's bottom side, loosen one of the stop screws **1**.



2. Guide the screw to the desired position and fasten it again.
3. Repeat the former steps for the second stop screw **2**.

#### Limiting the range for Y direction movements

- Procedure**
1. At the stage's top side, screw out the two fixing screws **5** of the stop screw's cover .



2. Remove the cover **6**.
3. Loosen one of the stop screws **3**.
4. Guide the screw to the desired position and fasten it again.

5. Repeat the former steps for the second stop screw **4**.

**Info**

For additional information and detailed descriptions, refer to further applicable documents or ask your ZEISS Sales & Service Partner.

**6.3.4 Replacing the LED Modules of the Colibri 3 LED Light Source**

**⚠ WARNING**

**Skin or eye injury due to hazardous light emission**

The light source belongs to Risk Group 3 as specified in IEC 62471 and emits LED radiation and UV radiation. Skin or eye injury can result from the exposure.

- ▶ Avoid any eye and skin exposure to the light-emitting aperture of the light source.
- ▶ Avoid exposure of skin to the radiation. Use suitable protective equipment/protective clothing if required.
- ▶ Before installing or removing the light source always make sure it is switched off.

For more information about the usability of LED modules for Colibri 3, see *Usability of LED Modules for the Colibri 3 LED Light Source* [▶ 145].

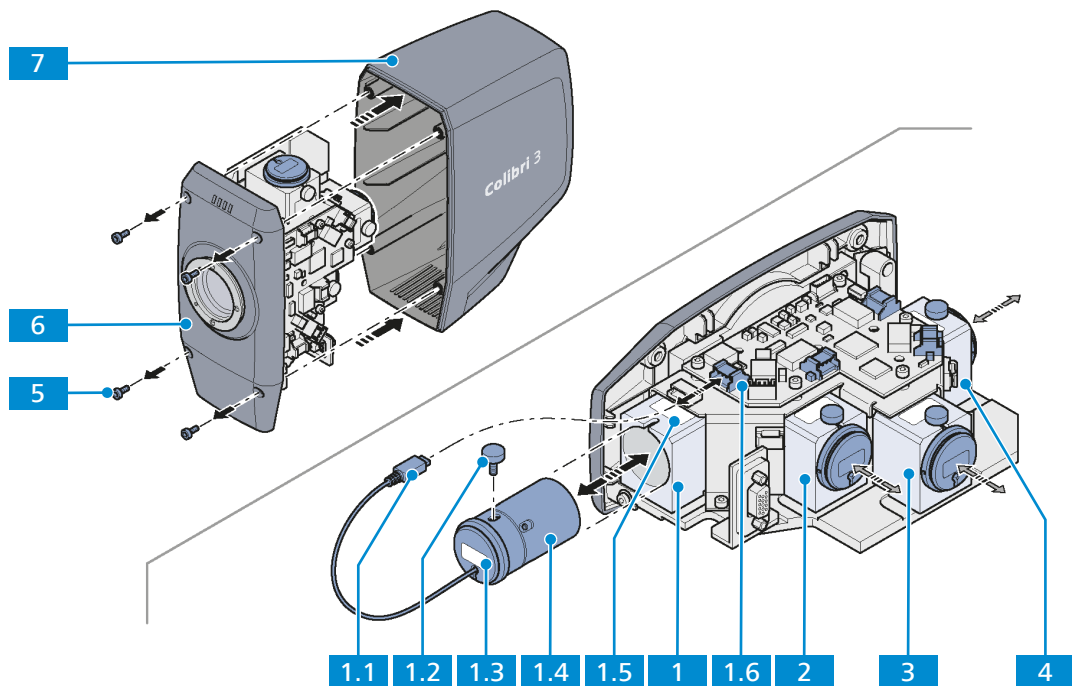





Fig. 53: Replacing the LED modules of the Colibri 3 light source

- |                                |                                                 |
|--------------------------------|-------------------------------------------------|
| <b>1</b> Slot 1 for LED module | <b>1.1</b> LED module power cable connector     |
| <b>1.2</b> Knurled screw       | <b>1.3</b> LED-specific label on the LED module |
| <b>1.4</b> LED module          | <b>1.5</b> LED-specific label on the slot       |
| <b>1.6</b> PCBA                | <b>2</b> Slot 2 for LED module                  |
| <b>3</b> Slot 3 for LED module | <b>4</b> Slot 4 for LED module                  |
| <b>5</b> Captive screw (4x)    | <b>6</b> Front side of Colibri 3                |
| <b>7</b> Colibri 3 housing     |                                                 |

**Parts and Tools**  Hex Key, 3.0 mm

- Prerequisite**  The microscope is switched off.  
 The plug of the light source's cable has been removed from the corresponding socket.  
 The Colibri 3 light source is removed from the microscope.

- Procedure**
1. Loosen the four captive screws **5** on the front side **6** of the light source.
  2. Remove the housing **7**.
  3. Disconnect the LED module power cable connector **1.1** from the PCBA **1.6**.
  4. Loosen the knurled screw **1.2**.
  5. Remove the old LED module **1.4**.
  6. Select the LED module with matching LED-specific labels **1.3** and **1.5**.
  7. Insert the LED module in the correct slot.
  8. Connect the LED module power cable connector to the PCBA.
  9. If required, replace the LED modules of LED slots 2, 3 and 4 in the same way.
  10. Re-mount the housing.

### 6.3.5 Replacing the TL LED 10 W Light Source

The present section applies to the following microscope types:

- Axiovert 5 TL
- Axiovert 5 TL SCB
- Axiovert 5 TL FL SCB
- Axiovert 5 RL TL SCB
- Axiovert 7 RL TL

#### CAUTION

##### **Eye damage or skin irritation due to hazardous light emission**

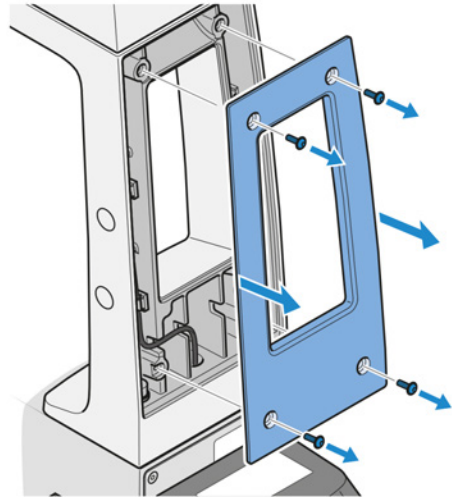
The light source belongs to Risk Group 2 as specified in IEC 62471 and emits LED radiation and UV radiation. Eye damage or skin irritation may result from exposure.

- ▶ Never look directly into the light-emitting aperture of the light source.
- ▶ Avoid exposure of skin to the radiation. Use suitable protective equipment/protective clothing if required.
- ▶ Before installing or removing the light source always make sure it is switched off.

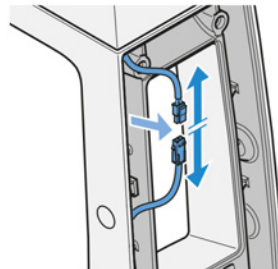
**Parts and Tools**  Hex Key, 2.0 mm  
 Hex Key, 3.0 mm

- Prerequisite**  The microscope is switched off and disconnected from the mains.

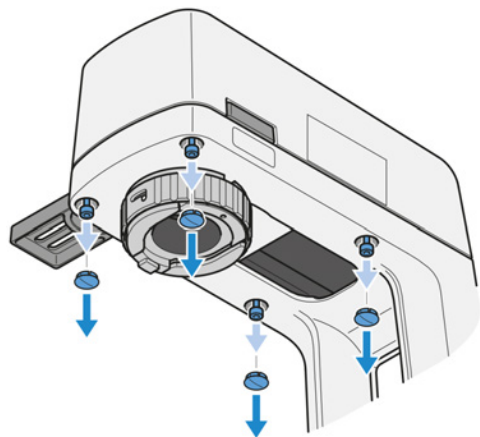
**Procedure** 1. Remove four screws on the rear cover.



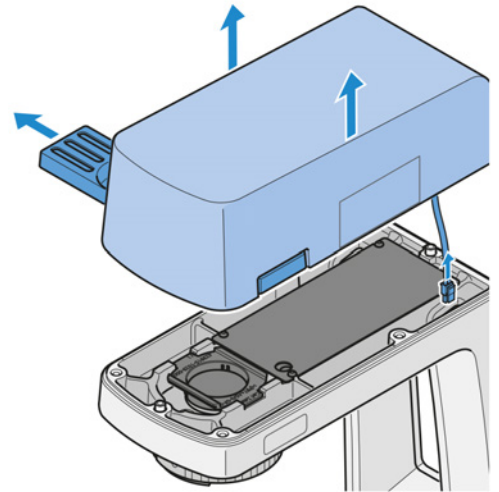
2. Remove the cover.
3. Unplug the connector of the TL light source.



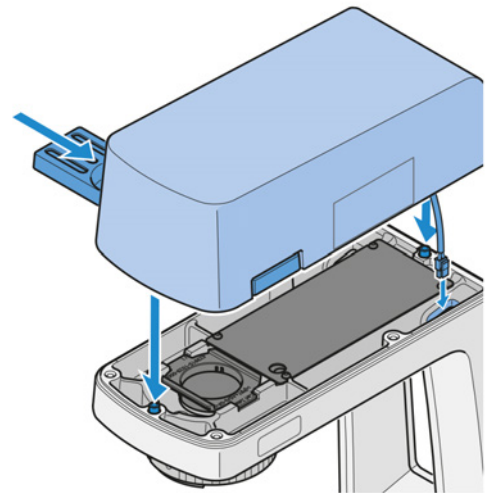
4. Remove four white covers of the screws.
5. Loosen four screws.



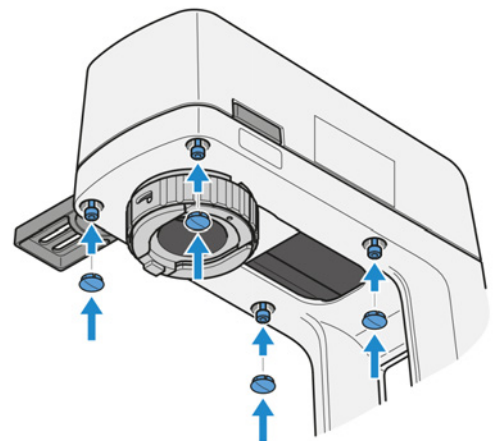
6. Remove the TL light source and the slider.



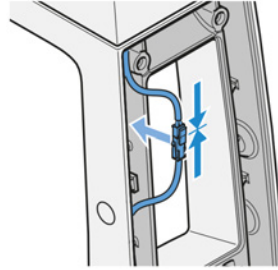
7. Remove the slider from the TL light source.
8. Insert the slider into the new TL light source.
9. Guide the plug of the new TL light source through the hole in the carrier for transmitted light.



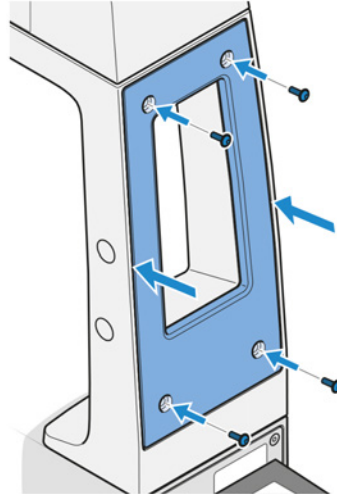
10. Fix the TL light source with four screws and replace the white covers.



11. Plug in the connector of the TL light source.



12. Fix the rear cover.





## 7 Troubleshooting

The following table provides hints for solving common problems. If you cannot solve the problem or if you are unsure about a certain technical difficulty, contact your local ZEISS service representative.

Symptom	Cause	Measure
No illumination light after switching on the microscope.	Nosepiece and/or reflector turret are not engaged to defined positions.	Move the nosepiece and/or reflector turret to the left or right to engage the nosepiece and/or reflector turret to defined positions. Then restart the microscope.
Shading or brightness irregularities in the field of view of the microscope; the field of view is not fully visible.	Nosepiece with objective is not fully engaged in its locking position.	Engage the nosepiece with the objective in its locking position.
	Aperture diaphragm is not adjusted correctly.	Adjust the aperture diaphragm correctly (centering, opening), see <i>Setting Up for Transmitted Light Brightfield Microscopy</i> [▶ 90].
	Filter is not correctly inserted in its slot.	Insert the filter correctly.
Low resolution and poor contrast.	Opening of the aperture diaphragm is not adjusted correctly.	Adjust the opening of the aperture diaphragm according to the 2/3-rule and the texture of the sample you are using, see <i>Setting Up for Transmitted Light Brightfield Microscopy</i> [▶ 90].
	Sample holder is not inserted correctly.	Turn the sample holder over, the sample side shows up.
	No immersion oil or an unspecified immersion oil is used with immersion objectives.	Use immersion oil 518 N or 518 F by ZEISS.
	Air bubbles in the immersion oil.	Repeat the oiling procedure with fresh oil.
	Immersion oil on the front lens of a dry objective.	Clean the lens.
	Dirt or dust on the optical surfaces of objectives, eyepieces, condensers or filters.	Clean the soiled optical component.
	Poor image quality in fluorescence microscopy	Phosphorescence blocking filter is not in the beam path.

Symptom	Cause	Measure
No light in eyepiece	The system is in ECO mode.	Turn the <b>Intensity/LM</b> knob clockwise to wake up the system.
	The light intensity is too low.	Turn the <b>Intensity/LM</b> knob clockwise to increase the light.
	The light was turned off by another pressing of the respective <b>RL/TL</b> button.	Press the <b>RL/TL</b> button according to the corresponding indicator in green color.
	The reflector module is incorrectly installed or absent.	Check the reflector turret and make sure the correct reflector is in use.
	The field diaphragm is closed.	Check and, if necessary, open the field diaphragm.
Asymmetric image sharpness, e.g. one side is sharp, one side is blurred.	Condenser is not adjusted properly.	Re-adjust the condenser, see <i>Setting Up for Transmitted Light Brightfield Microscopy</i> [▶ 90].
	Nosepiece is not engaged in its locking position.	Engage the nosepiece in its locking position (click-diaphragm).
	Sample is not fixed correctly on the mechanical stage.	Insert and fix the sample correctly in the sample holder.
Distinct focus differences when changing the objective.	Objective is not screwed in all the way.	Screw the objective in to the stop.
The left and the right field of view cannot be brought together in one image.	Distance of the eyepiece (distance of the pupils) is not adjusted correctly.	Re-adjust the distance of the eyepiece, see <i>Adjusting the Position of the Eyepieces</i> [▶ 85].
Using the microscope fatigues the eyes.	Distance of the eyepiece (distance of the pupils) is not adjusted correctly.	Re-adjust the distance of the eyepiece, see <i>Adjusting the Position of the Eyepieces</i> [▶ 85].
	Image brightness is unacceptable.	Adjust the lamp voltage or insert a conversion filter.
	Binocular tube is misaligned optically, mechanically.	Call in service personnel for check-up/ repair.
Dirt or dust in the field of view.	Opening of the aperture diaphragm is too small.	Adjust the opening of the aperture diaphragm according to the 2/3-rule or according to the texture of the sample, see <i>Setting Up for Transmitted Light Brightfield Microscopy</i> [▶ 90].
	Dirt or dust on optical surfaces of objectives, eyepieces, condensers, filters or samples.	Clean the optical surfaces of the soiled components, see <i>Cleaning an Optical Surface</i> [▶ 130].

Tab. 4: Troubleshooting on the microscope

## 7.1 Resetting the Microscope to the Factory Settings

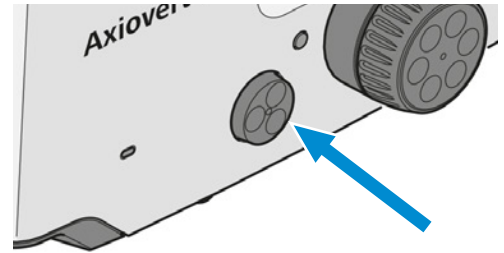
### NOTICE

Please use this function with caution as it will reset all existing configurations.

The default factory settings are:

- The Light Manager is enabled, but no light intensity values are saved.
- The light intensity is set to the initial minimum value.
- All stored configurations are cleared.

- Procedure**
1. Press and hold down the **LM** knob for 20 seconds.



- While the knob is held down from 3 s to 20 s, the indicator light blinks in RED.
  - After 20 s the indicator light blinks green.
- ↳ When the indicator stops blinking and remains GREEN, the reset to the default factory setting is successful.

## 8 Decommissioning and Disposal

This chapter contains information on the decommissioning and disposal of the microscope and its expansions/components or accessories.

### 8.1 Decommissioning

If the microscope and its components are not used for an extended period of time such as several months, they should be shut down completely and secured against unauthorized access.

#### NOTICE

##### Property damage due to short circuit

When the microscope is still switched on, coming in contact with electronic parts can lead to a short circuit.

- ▶ Switch off the microscope prior to opening or cleaning.
- ▶ Disconnect live parts from the power supply.

- Procedure**
1. Switch off the microscope.
  2. Pull the mains plug.

### 8.2 Transport and Storage

The following regulations must be observed before and during transport:

- Use devices (e.g. handles, fork lifts or hand pallet trucks) to transport the microscope safely to the installation room. In clean-room environments, this check is mandatory. The microscope may only be transported in air-suspended vehicles. Devices for transporting the microscope must be rated to handle its full weight and dimensions.
- Moving parts must be secured during transport to prevent them from slipping or tipping over.
- Avoid rocking the transport boxes back and forth.
- Note the weight information on the package and on the shipping document.
- Where possible, the original packaging must be used for shipping or transport.

**Allowable temperatures** Allowable temperature during on-site storage and transport in packaging:

- Between -40 °C and +70 °C
- Relative humidity less than 93 % at +40 °C

Allowable temperature during shipping in packaging:

- Between -40 °C and +70 °C
- Relative humidity less than 93 % at +40 °C

#### Info

**24 hours before installation** of the microscope it is required that the boxes be at recommended room temperature to avoid ingress of humidity, which is very harmful to optical paths, and to ensure effective stability of the microscope during installation and testing.

### 8.3 Disposal

The microscope and its components must not be disposed of as domestic waste or through municipal disposal companies. They must be disposed of in accordance with applicable regulations (WEEE Directive 2012/19/EU). ZEISS has implemented a system for the return and recycling of devices in member states of the European Union that ensures suitable reuse according to the EU Directives mentioned. The customer is responsible for decontamination.

#### Info

Detailed information on disposal and recycling is available from your ZEISS Sales & Service Partner.

### 8.4 Decontamination

A decontamination statement must be submitted before returning any used objects to the ZEISS location.

If reliable decontamination cannot be guaranteed, the hazard must be marked according to applicable regulations. In general, a well-visible warning sign must be affixed to the article itself and to the outside of the packaging, together with detailed information on the type of contamination.

## 9 Technical Data and Conformity

This chapter contains important technical data as well as information on the conformity.

### 9.1 Performance Data and Specifications

The microscope must only be operated in closed rooms. It is recommended to install the microscope in a dimmed room where artificial illumination, sunlight or other light sources cannot interfere with image acquisition. The microscope should not be installed near radiators or windows with direct sunlight. The microscope must be placed securely on the table surface to prevent slipping and falling.

Compliance with the installation requirements of the microscope and the availability of the requested supplies is the responsibility of the customer and has to be readily available at the time of installation.

The microscope must be plugged into a properly installed power socket with protective earth contact using the supplied mains cable. The protective earth connection must not be impaired by the use of extension cables.

#### Info

Your ZEISS Sales & Service Partner will provide you with the detailed installation requirements.

#### Weight and Sizes

Main Components	Length (mm)	Width (mm)	Height (mm)	Weight (kg)
Axiovert 5 TL	503	244	505	11.0
Axiovert 5 TL SCB	503	244	505	11.2
Axiovert 5 TL FL SCB	658	402	505	12.2
Axiovert 5 RL SCB	587	306	383	10.5
Axiovert 5 RL TL SCB	587	294	505	13.0
Axiovert 7 RL	587	306	383	10.7
Axiovert 7 RL TL	587	294	505	13.0

#### Air Conditioning and Quality

Temperature range for operation with indicated performance (24 h per day, regardless of whether the microscope is in operation or switched off)	5 to 40 °C
Relative humidity	< 80 % at 40 °C
Atmospheric pressure / altitude	800 to 1060 hPa / ≤ 2000 m above sea level
Pollution degree	2

#### Mains connection

Nominal AC voltage	L/N/PE 100 to 240 VAC ± 10 %
Nominal frequency	50/60 Hz
Max. current	1.4 A
Rating for microscope stand	24 VDC, 5 A
Protection class	IP20 (IEC 60529)
Overvoltage Category	II

## 9.2 Applicable Standards and Regulations

Observe all general and country-specific safety regulations as well as applicable environmental protection laws and regulations.

The microscope is in compliance with the requirements of the following regulations and directives:

2011/65/EU	Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)
2015/863/EU	Commission Delegated Directive (EU) 2015/863 of 31 March 2015 amending Annex II to Directive 2011/65/EU of the European Parliament and of the Council as regards the list of restricted substances (RoHS Directive III)
EN 61010-1:2019	Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements
EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

According to directive 2011/65/EU (RoHS) the microscope and its accessories have been classified as instrument category 9 (Monitoring and control instruments including industrial monitoring and control instruments). They also fall under 2012/19/EU (WEEE).

European and International Directives / Standards: For more information on ISO and CSA certificates or CE Declarations of Conformity, contact your ZEISS Sales & Service Partner.

ZEISS works according to a certified Environment Management System according to ISO 14001. The microscope and its components were developed, tested, and produced in accordance with the valid regulations and guidelines for environmental law of the European Union.

Only applicable for Axiovert 5/7 materials

2014/30/EU	Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility
2014/35/EU	Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits

Not applicable for Axiovert 5/7 materials

2017/746/EU	Regulation (EU) 2017/746 of the European Parliament and of the Council of 5 April 2017 on in vitro diagnostic medical devices and repealing Directive 98/79/EC and Commission Decision 2010/227/EU
EN 61010-2-101:2017	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 2-101: Particular requirements for in vitro diagnostic (IVD) medical equipment
EN 61326-2-6:2013	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-6: Particular requirements - In vitro diagnostic (IVD) medical equipment

**Declaration of  
China RoHS 2  
关于电器电子产品  
有害物质限制  
说明**

Microscopes and accessories of the Carl Zeiss Suzhou Co.,Ltd., are in compliance with China RoHS Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) SJ/T 11364 with respect to lead, mercury, cadmium, hexavalent chromium, poly-brominated biphenyls (PBB) or polybrominated diphenylethers (PBDE) content.  
兹证明，根据中国电器电子产品有害物质限制使用管理办法，我司产品符合中国对电器电子产品中含铅及其化合物、汞及其化合物、镉及其化合物、六价铬化合物、多溴联苯、多溴二苯醚六种有害物质的法规要求

The toxic substances or elements  
有毒有害物质或元素

	Lead (Pb) 铅	Mercury (Hg) 汞	Cadmium (Cd) 镉	Hexava- lent chromiu m (Cr6+) 六价铬	Poly- bromi- nated diphenyl ether (PBB) 多溴联苯	Poly- bromi- nated diphenyl ether (PBDE) 多溴二苯 醚
Cable 电线	x	o	o	o	o	o
Electroni- cal Parts 电子电路	x	o	o	o	o	o
Optical Parts 光学部件	x	o	x	o	o	o
Mechani- cal Parts 机械部件	x	o	o	o	o	o
Lamps 灯	x	x	o	o	o	o

o = Indicates that this toxic or hazardous substance contained in the homogeneous materials for this part, is below the limit requirement in GB/T 26572

表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下。



x = Indicates that this toxic or hazardous substance contained in the homogeneous materials for this part, is above the limit requirement in GB/T 26572.

表示该有害物质至少在该部件某一均质材料中的含量超出GB/ T26572规定的限量要求。

有关废弃物处理办法, 请与我司中国销售部联系:

卡尔蔡司 ( 上海 ) 管理有限公司 中国 ( 上海 ) 自由贸易试验区美约路 60 号

邮编 200131

电话: +86 ( 21 ) 20821188

传真: +86 ( 21 ) 50481193

### 9.3 Usability of LED Modules for the Colibri 3 LED Light Source

Position	Slot 1	Slot 2	Slot 3	Slot 4
Wavelength range (nm)	450-480	350-415	594-660	508-565
LED module 385 nm (423052-9593-000)	X	O	X	X
LED module 470 nm (423052-9573-000)	O	X	X	X
LED module 505 nm (423052-9562-000)	X	X	X	O
LED module 565 nm (423052-9602-000)	X	X	X	O
LED module 590 nm (423052-9543-000)	X	X	O	X
LED module 625 nm (423052-9522-000)	X	X	O	X

O = usable

X = not usable

## 10 Accessories and Optional System Expansions

Only the following accessories may be used with the microscope as their safe use has been confirmed by ZEISS. Only original parts from ZEISS may be used. Check in advance whether your microscope can be retrofitted with a system expansion or accessories.

After installation or conversion it must be carefully checked whether the microscope and its system expansions/accessories are in a safe operational state and whether unused ports are closed. For details and safety measures please refer to the associated documents.

### Info

Further information on the software and its operation is available in the software's online help.

### Info

For additional information and detailed descriptions, refer to further applicable documents or ask your ZEISS Sales & Service Partner.

Name	Description/info
Various objectives	<p>The performance of the microscope objectives affects the image quality of your microscope like no other system component. Whether you work with histological samples, cell samples or entire organisms – the suitability of microscope objectives for your application depends on various factors.</p> <p>More detailed information on available and recommended objectives can be found at <a href="https://www.micro-shop.zeiss.com/de/de/shop/objectives">https://www.micro-shop.zeiss.com/de/de/shop/objectives</a> or ask your ZEISS Sales &amp; Service Partner.</p>
Various sample stages/ scanning stage	Sample stages can be adjusted in XY direction (manual or power controlled). The stage's range of travel depends on the type.
Filter sets	Filters are available for various dyes and dye combinations.
Light sources	<p>The following light sources are available:</p> <ul style="list-style-type: none"> <li>▪ LED 10</li> <li>▪ Colibri 3</li> </ul> <p>The following light sources must be ordered separately:</p> <ul style="list-style-type: none"> <li>▪ Colibri 5</li> <li>▪ Colibri 7</li> <li>▪ HAL 100 [▶ 157]</li> <li>▪ HBO 50 [▶ 161]</li> <li>▪ HXP 120 V [▶ 163]</li> <li>▪ X-Cite Xylis® [▶ 163]</li> </ul>
Aqua stop	The <i>aqua stop</i> [▶ 150] protects the objectives and the nosepiece when working with liquid samples.

## 10.1 Approved Optical Configurations

The following combinations of condensers, objectives, and diffusion disks are recommended:

Condenser	Objective	Diffusion disk
LD condenser 0.3 for slider	Objective 1.25x	Diffusion disk 1.25x in the slider of the condenser
	Objectives 2.5x to 40x *	-
LD condenser 0.4 for slider	Objective 2.5x	Diffusion disk 2.5x in the slider of the condenser
	Objectives 5x to 63x *	-
LD condenser 0.4 for H Ph PlasDIC DIC iHMC	Objectives 5x to 100x	-
LD condenser 0.55 for H Ph PlasDIC DIC	Objectives 5x to 100x	-

\* Use with objective 100x possible, but higher contrast and thus lower resolution due to difference in aperture.

## 10.2 Assembling the Adapter for Expansion of the Sample Space

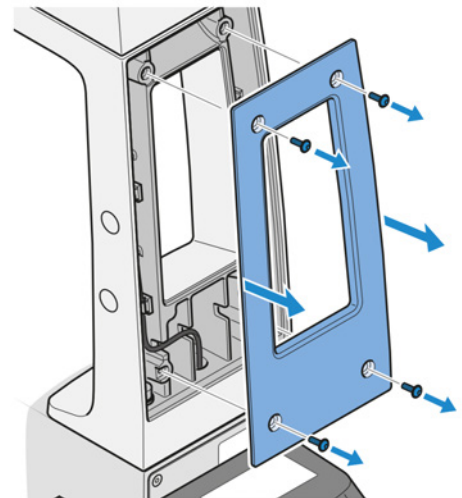
The present section applies to the following microscope types:

- Axiovert 5 TL
- Axiovert 5 TL SCB
- Axiovert 5 TL FL SCB

- Parts and Tools**
- 🔧 Hex Key, 2.0 mm
  - 🔧 Hex Key, 5.0 mm
  - 🔧 Hex Key, 8.0 mm

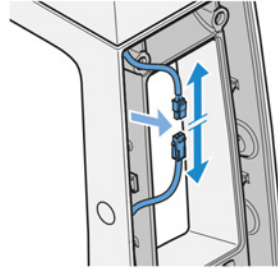
**Prerequisite** ✓ The microscope is switched off and disconnected from the mains.

**Procedure** 1. Remove four screws on the rear cover.

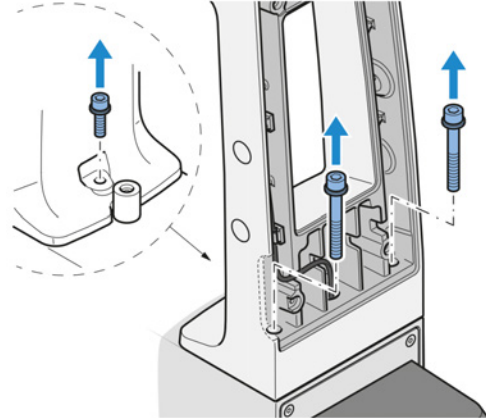


2. Remove the cover.

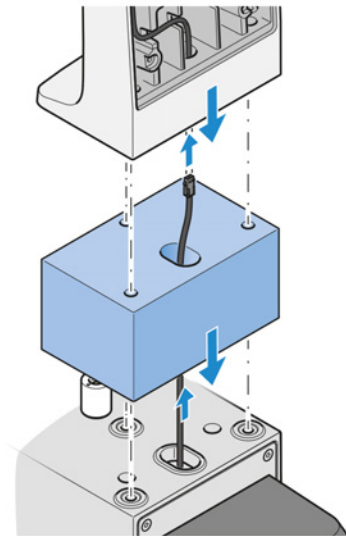
3. Unplug the connector of the TL light source.



4. Remove two screws. Use the hex key 8.0 mm.

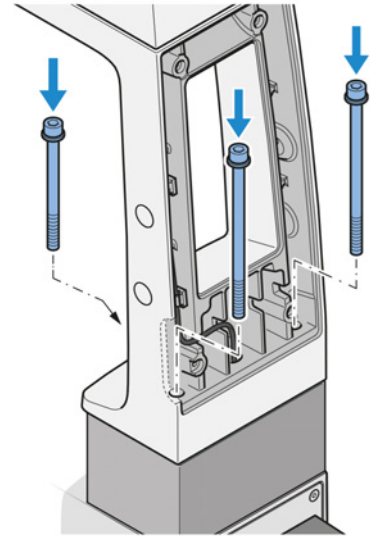


5. On the frontside of the stand, remove one screw. Use the hex key 5.0 mm.
6. Remove the carrier transmitted light illumination and pull the cable through the hole.
7. Put the cable through the hole in the adapter for expansion.

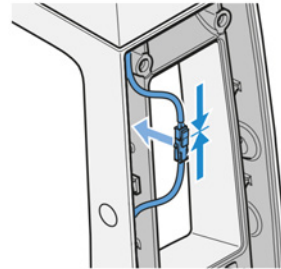


8. Fix the adapter for expansion with the lower part of the two-piece screws.
9. Put the cable through the hole in the carrier for transmitted light illumination.

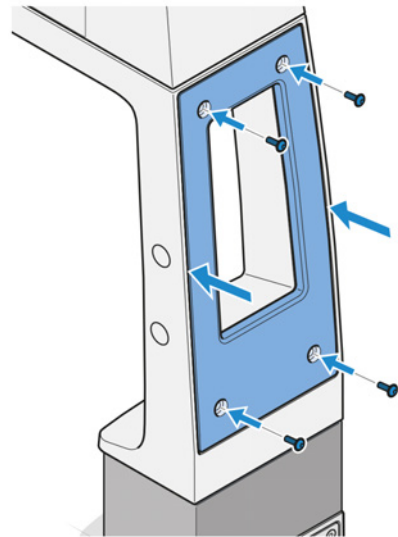
10. Fix the carrier transmitted light illumination with the upper part of the two-piece screws.



11. Plug in the connector of the TL light source.



12. Fix the rear cover.



## 10.3 Aqua Stop II

**Purpose** The aqua stop II protects the objectives and the nosepiece when working with liquid samples.

**Position** The aqua stop II is mounted on the nosepiece carrier.

### 10.3.1 Assembling the Aqua Stop II

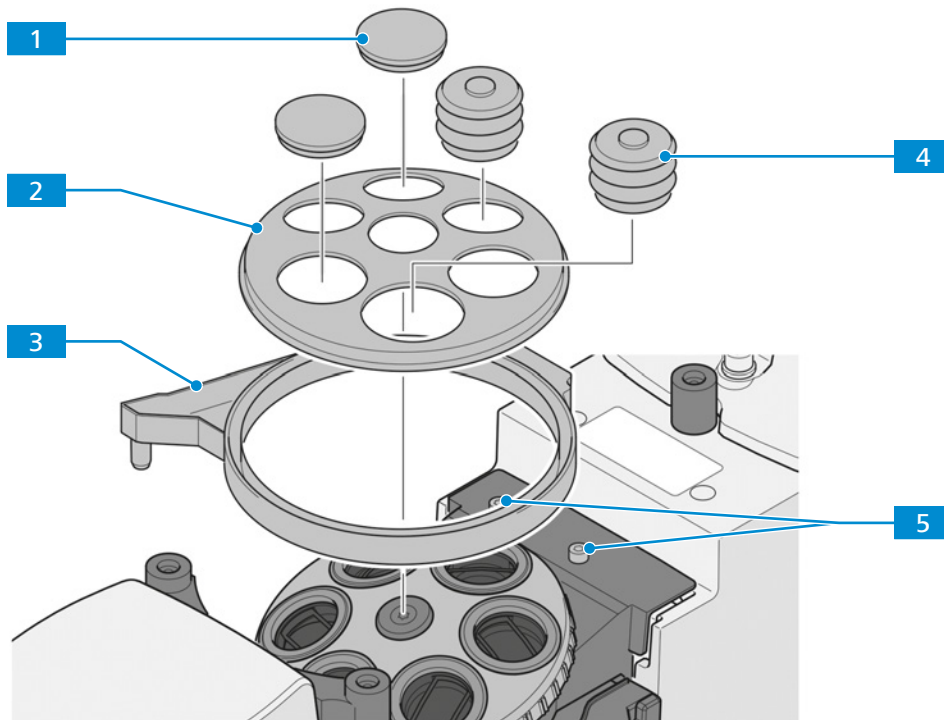


Fig. 54: Assembling the aqua stop II

- |                            |                     |
|----------------------------|---------------------|
| <b>1</b> Cover cap         | <b>2</b> Cover disc |
| <b>3</b> Collecting trough | <b>4</b> Lens hood  |
| <b>5</b> Mounting holes    |                     |

**Parts and Tools**  Hex Key, 3.0 mm

- Prerequisite**
- ✓ The stage is removed from the stand.
  - ✓ All objectives and cover caps are removed from the nosepiece [▶ 65].

- Procedure**
1. Remove the two cover screws from the mounting holes **5**.
  2. Place the collecting trough **3** on the nosepiece mount.
  3. Screw the collecting trough's two screws into the mounting holes **5**.
  4. Place the cover disk **2** at the nosepiece, matching the corresponding holes to those for the objectives.
  5. Install the required objectives.
  6. **NOTICE Make sure that each objective is enclosed up to the cover disk and that no hood's upper edge forms a drip tray!**
    - Pull a **small** lens hood **4** over each objective of a front diameter of **16 to 22.5 mm**.
    - 7. Pull a **large** lens hood **4** over each objective of a front diameter of **27.5 to 34 mm**.
  8. Close the unused nosepiece openings with cover caps **1**.

9. Attach one end of the drainage tube to the collecting trough's drainage connector.
10. Put the drainage tube's other end through the collecting bottle's plug, such that the tube protrudes about 4 mm below the plug.
11. **NOTICE Adjust the drainage tube such that it will not be bent through focusing.**  
Firmly insert the plug into the collecting bottle.
12. Attach the Velcro® fastener to the stand.
13. Fix the collecting bottle with the Velcro® fastener to the stand.
14. Install the stage.

Proceed in the reverse order for removal.

## NOTICE

### Performance impairment by liquids

Residues of accidents involving liquids are very likely to impair the performance of optical parts.

- ▶ After any accident involving liquids, remove the stage and soak up every drop of liquid from the optics and the nosepiece with a lint-free cloth.
- ▶ Pay special attention to cleaning the front lens of the objective!

Cleaning instructions can be found in the brochure "The Clean Microscope".

## 10.4 Sliders for Reflected Light and Fluorescence

The present section applies to the following microscope types:

- Axiovert 5 TL FL SCB
- Axiovert 5 RL SCB
- Axiovert 5 RL TL SCB
- Axiovert 7 RL
- Axiovert 7 RL TL

### 10.4.1 Filter Slider A 14x4 mm, 2 Positions and Filter Slider A 14x4 mm, 3 Positions

**Purpose** The filter slider A can be used for the following RL contrast techniques:

- brightfield
- DIC
- C-DIC
- polarization contrast

**Function** The filter slider A is used for light and neutral density filters for reflected light with  $d = 25$  mm. The following filter types can be used:

- grey filters that only reduce the intensity of the light
- conversion filters for adapting the LED light to the color impression of halogen light

Because of an already mounted metal plate the filter slider A is also usable as manual shutters for epi-fluorescence.

**Position** The filter slider A is inserted into the 14x40 mm slot marked F on the stand.

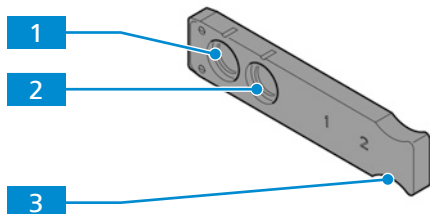


Fig. 55: Filter slider A 14x4 mm, 2 positions

- 1** Empty position
- 2** Position for neutral density filter
- 3** Handle

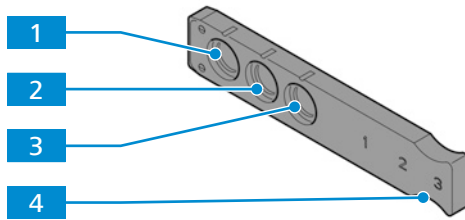


Fig. 56: Filter slider A 14x4 mm, 3 positions

- 1** Empty position
- 2** Position for neutral density filter
- 3** Position for neutral density filter
- 4** Handle

### 10.4.2 Stop Slider A 14x40 mm with Aperture Diaphragm

**Purpose** The stop slider is used to set the aperture for the following RL contrast techniques:

- brightfield
- darkfield
- DIC
- C-DIC
- polarization contrast

**Function** The stop slider A is equipped with a setting wheel to open or close the aperture diaphragm.

**Position** The stop slider A is inserted into the slot marked A on the stand.

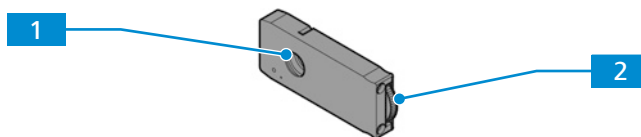


Fig. 57: Stop slider A 14x40 mm with aperture diaphragm

- 1** Aperture diaphragm
- 2** Setting wheel



### 10.4.3 Slider 14x40 FL Attenuator

**Purpose** The FL attenuator is used alternatively to the Stop slider A 14x40 mm with aperture diaphragm for epi-fluorescence.

**Function** The FL attenuator is equipped with a setting wheel, which can be set to the following 6 positions:

- clear aperture
- 70% transmission
- 50% transmission
- 40% transmission
- 20% transmission
- 2% transmission

**Position** The FL attenuator is inserted into the slot marked A on the stand.

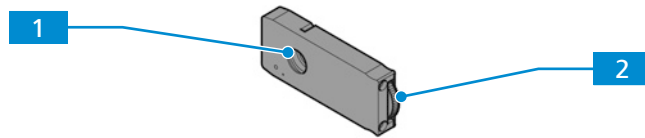


Fig. 58: Slider 14x40 FL attenuator

**1** Aperture stop

**2** Setting wheel

### 10.4.4 Stop Slider A with Aperture/Luminous Field Diaphragm

**Purpose** The stop slider is used to set the luminous field for the following RL contrast techniques:

- brightfield
- darkfield
- DIC
- C-DIC
- polarization contrast
- fluorescence

**Function** The stop slider A is equipped with a setting wheel to open or close the luminous field diaphragm.

**Position** The stop slider A is inserted into the slot marked F on the stand.

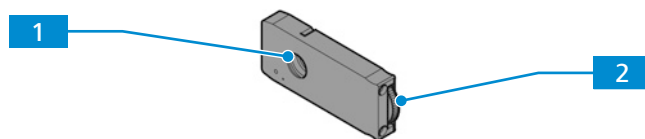


Fig. 59: Stop slider A with aperture/luminous field diaphragm

**1** Aperture/luminous field diaphragm

**2** Setting wheel

## 10.5 Sliders for Transmitted Light

The present section applies to the following microscope types:

- Axiovert 5 TL
- Axiovert 5 TL SCB
- Axiovert 5 TL FL SCB
- Axiovert 5 RL TL SCB
- Axiovert 7 RL TL

### 10.5.1 Slider PlasDIC for LD A-Plan 10x-63x

**Purpose** This slider is used for TL PlasDIC.

**Function** The slider PlasDIC is equipped with a setting screw to set the contrast.

**Position** The slider PlasDIC is inserted into one of the DIC slots on the *nosepiece* [▶ 40].



Fig. 60: Slider PlasDIC for LD A-Plan 10x-63x

- |                        |                        |
|------------------------|------------------------|
| <b>1</b> PlasDIC prism | <b>2</b> Setting screw |
|------------------------|------------------------|

### 10.5.2 Slider 10x46 mm Ph/PlasDIC, H, Ph/PlasDIC

**Purpose** This slider can be used for the following TL contrast techniques:

- brightfield
- phase contrast
- PlasDIC

**Function** The center position of the slider 10x46 mm Ph/PlasDIC, H, Ph/PlasDIC is equipped with a neutral density filter 0.06. The two remaining positions can be used for Ph or Plas DIC diaphragms.

**Position** The slider is inserted into the slot on the LD condenser.

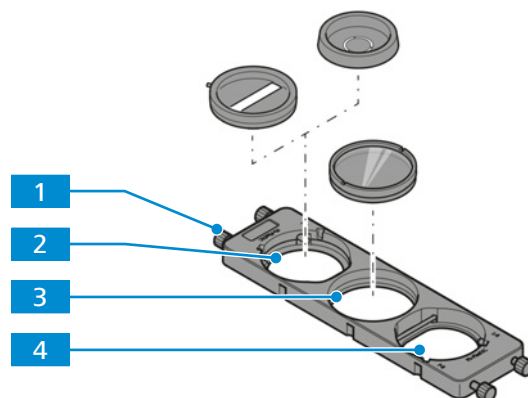
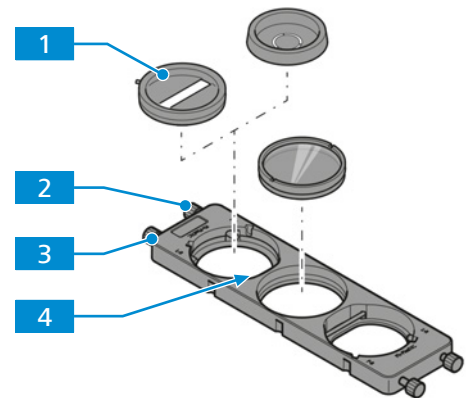


Fig. 61: Slider 10x46 mm Ph/PlasDIC, H, Ph/PlasDIC

- |                                      |                         |
|--------------------------------------|-------------------------|
| <b>1</b> Centering screws            | <b>2</b> Empty position |
| <b>3</b> Neutral density filter 0.06 | <b>4</b> Empty position |

### 10.5.2.1 Assembling Diaphragms in the Slider 10x46 mm Ph/PlasDIC, H, Ph/PlasDIC

**Procedure** 1. Loosen the centering screws **2**, **3**.



2. Insert the diaphragm **1** at an angle, pressing against the leaf spring **4**.
3. Screw in the centering screws **2**, **3** until the diaphragm **1** is fixed and is approximately centered in the mount.

### 10.5.3 Slider 10x46 mm with Fixed Phase Stop Ph1

**Purpose** This slider can be used for TL phase contrast.

**Function** The slider is equipped with a fixed phase stop.

**Position** The slider is inserted into the slot on the LD condenser for slider.



Fig. 62: Slider 10x46 mm with fixed phase stop Ph1

**1** Phase stop Ph1

### 10.5.4 Polarizer Slider D 10x46 mm, 90° rotatable

**Purpose** This slider can be used for the TL iHMC and polarization contrast.

**Function** The polarizer slider D 10x46 mm, 90° rotatable is equipped with polarizer.

**Position** The slider is inserted into the slot on the LD Condenser 0.4 for H Ph PlasDIC DIC iHMC [▶ 45].

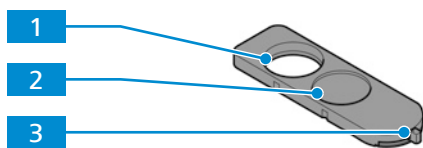


Fig. 63: Polarizer slider D 10x46 mm, 90° rotatable

- 1** Empty position
- 2** Polarizer
- 3** Lever for adjusting the vibration direction of the polarizer

### 10.5.5 3 Position Contrast Slider 10x29 mm

**Purpose** This slider can be used for the following TL contrast techniques:

- DIC
- PlasDIC

**Function** The 3 position contrast slider 10x29 mm can be equipped with the following components:

- analyzer fixed for contrast slider 10x29 mm
- PlasDIC module LD A-Plan 10x-63x for contrast slider 10x29 mm

**Position** The slider is inserted into the slot below the nosepiece.

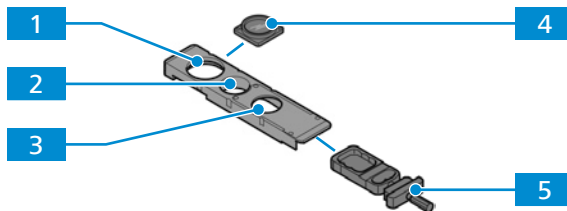


Fig. 64: 3 position contrast slider 10x29 mm

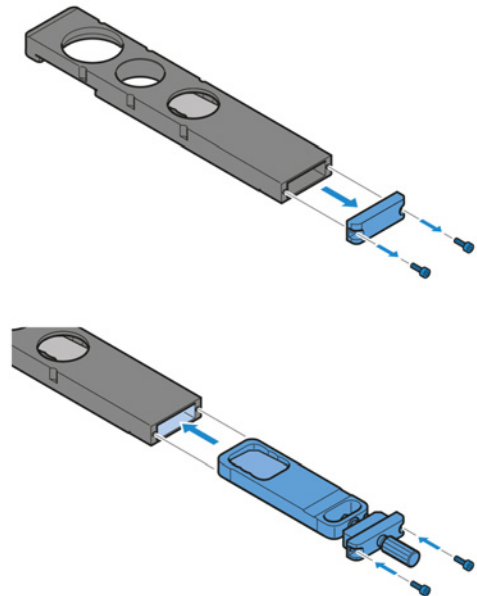
- |                                                                                                                                                                               |                                                                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| <p><b>1</b> Position for the analyzer fixed</p> <p><b>3</b> Position for the PlasDIC module</p> <p><b>5</b> PlasDIC module LD A-Plan 10x-63x for contrast slider 10x29 mm</p> | <p><b>2</b> Empty position</p> <p><b>4</b> Analyzer fixed for contrast slider 10x29 mm</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|

#### 10.5.5.1 Assembling the PlasDIC Module to the 3 Position Contrast Slider

**Parts and Tools** Hex key, 1.5 mm

- Procedure**
1. Loosen two screws.
  2. Remove the cover plate.

3. Insert the PlasDIC module LD A-Plan 10x-63x into the 3 position contrast slider.



4. Fix the PlasDIC module with two screws.

## 10.6 External Light Sources

### Info

The external light sources are not controlled by the microscope. Therefore they cannot be used with the Light Manager function.

### 10.6.1 HAL 100 Light Source

**Purpose** The HAL 100 serves as a light source for the reflected light process.

**Position** The HAL 100 is installed on the reflected light port on the backside of the stand.

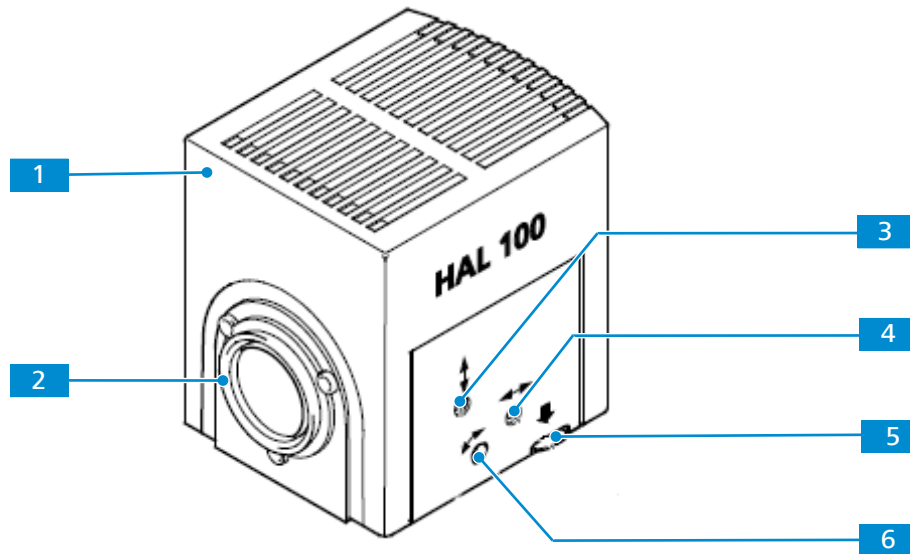
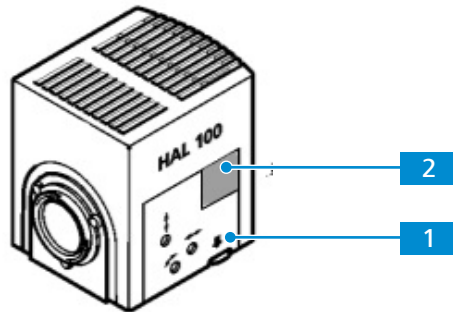


Fig. 65: HAL 100

- |                                   |                                     |
|-----------------------------------|-------------------------------------|
| <b>1</b> Lamp housing             | <b>2</b> Dovetail ring              |
| <b>3</b> Vertical adjusting screw | <b>4</b> Horizontal adjusting screw |
| <b>5</b> Release button           | <b>6</b> Adjusting screw            |

### 10.6.1.1 Warning Labels on the HAL 100 Light Source

For safe functioning of the light source together with the microscope, the instruction manual of the light source is to be observed.

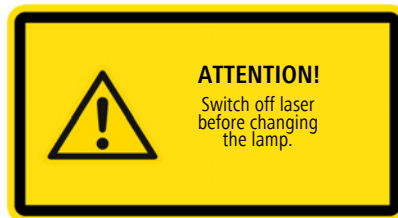


1



Hot surface! Do not touch.

2



CAUTION!

Avoid direct irradiation of eyes when cover is open. Switch off lasers before changing the lamp!

#### Info

Always consider all warning labels and lights on the complete microscope. They are to be kept in clean and easily legible condition. Damaged or illegible warning labels must be replaced immediately.

### 10.6.1.2 Assembling the HAL 100 Light Source

#### CAUTION

##### Burning hazard due to hot light sources

Light sources can become hot during processing.

- ▶ Avoid touching the hot light source housing.
- ▶ Let the light source cool down before touching it.

#### NOTICE

##### Heat damage

The HAL 100 bulb replacement tool might suffer damage from the emitted heat during the light source operation.

- ▶ Remove the bulb replacement tool from the HAL 100 housing before installing the light source.
- ▶ Do not operate the light source with the bulb replacement tool attached to its housing.

**Parts and Tools**  Hex Key, 3.0 mm

- Prerequisite**
- ✓ The microscope is switched off.
  - ✓ The HAL 100 light source is switched off.
  - ✓ The bulb replacement tool is removed from the light source housing.

- Procedure**
1. At the reflected light port, loosen the clamping screw.
  2. Insert the light source's dovetail ring into the illumination mount.
  3. Fasten the clamping screw.
  4. At the external power supply unit, insert the plug of the light source's cable into the **RL** port.

Proceed in the reverse order for removal.

### 10.6.1.3 Adjusting the HAL 100

#### CAUTION

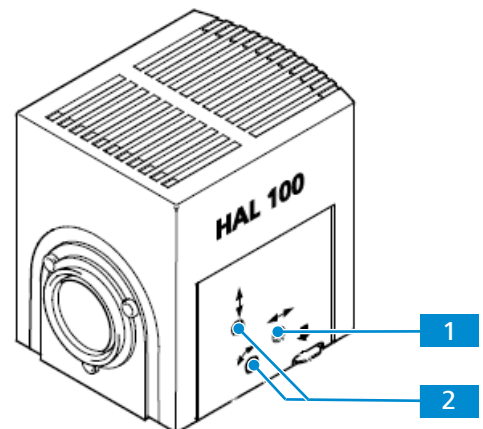
##### Eye injury due to light emission

Directly looking into emitted light can damage the eye.

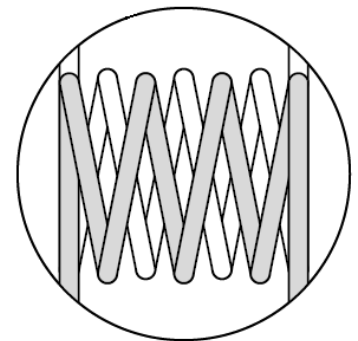
- ▶ Do not look into the light exit aperture of the light source.

**Parts and Tools**  Screwdriver, 3.0 mm, ball head

- Procedure**
1. Loosen clamping screw on the port.
  2. Remove halogen lamp.
  3. Switch on the microscope.
  4. Direct light beam to a projection surface (wall) with a minimum distance of 3 m.
  5. Set adjusting screw **1** so that both images of the lamp filaments are visible on the projection surface as sharply as possible.



6. Set adjusting screws **2** so that the lamp filaments of one image exactly covers the gaps of the reflector image.



7. Attach halogen lamp to port.
8. Tighten clamping screw.

### 10.6.1.4 Replacing the Halogen Bulb 12 V, 100 W

#### ⚠ CAUTION

##### Eye damage or skin irritation due to hazardous light emission

The light source belongs to Risk Group 2 as specified in IEC 62471 and emits LED radiation and UV radiation. Eye damage or skin irritation may result from exposure.

- ▶ Never look directly into the light-emitting aperture of the light source.
- ▶ Avoid exposure of skin to the radiation. Use suitable protective equipment/protective clothing if required.
- ▶ Before installing or removing the light source always make sure it is switched off.

#### ⚠ CAUTION

##### Burning hazard due to hot light sources

Light sources can become hot during processing.

- ▶ Avoid touching the hot light source housing.
- ▶ Let the light source cool down before touching it.

The light source does not have to be removed from the microscope for replacing the bulb.

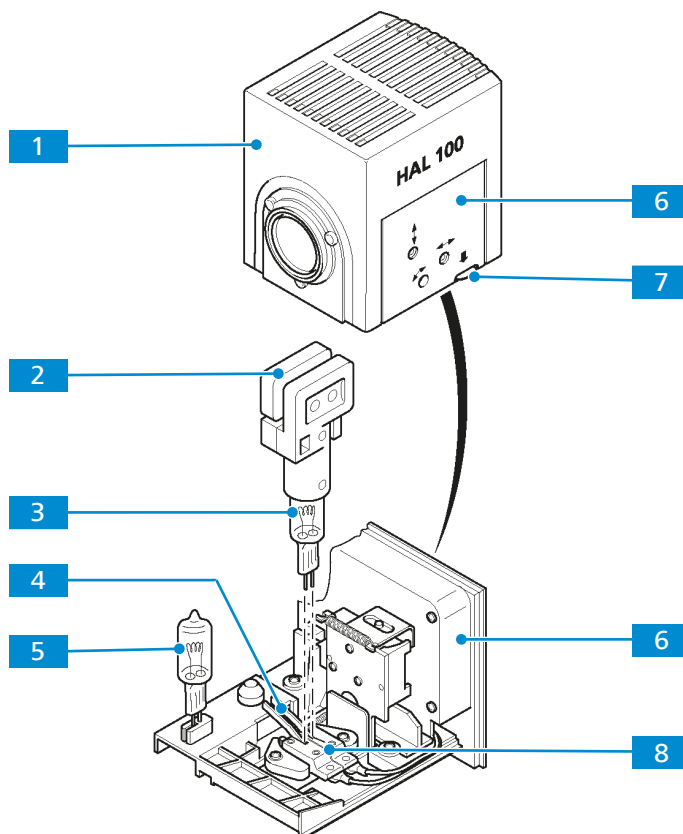


Fig. 66: Replacing the HAL 100 light source bulb

- |          |                  |          |                       |
|----------|------------------|----------|-----------------------|
| <b>1</b> | HAL 100 housing  | <b>2</b> | Bulb replacement tool |
| <b>3</b> | Old bulb         | <b>4</b> | Spring lever (2x)     |
| <b>5</b> | Replacement bulb | <b>6</b> | Bulb carrier          |
| <b>7</b> | Release button   | <b>8</b> | Bulb socket           |



- Prerequisite**
- ✓ The microscope is switched off.
  - ✓ The plug of the light source's cable has been removed from the corresponding socket.
  - ✓ The light source has cooled down for about 15 minutes.
- Procedure**
1. Press the release button **7** and pull the bulb carrier **6** completely out to the side.
  2. Put the bulb replacement tool **2** onto the old bulb **3**.
  3. Press down the two spring levers **4** and remove the tool with the bulb in upward direction.
  4. **NOTICE Do not touch the new bulb with bare hands!**  
Put the bulb replacement tool onto the replacement bulb **5**.
  5. Press down the two spring levers and insert the new bulb into the bulb socket **8**.
  6. To center the bulb, briefly press the spring levers once more.
  7. **NOTICE Do not leave the bulb replacement tool inside the light source.**  
Insert the lamp carrier into the Hal 100 housing **1** and slide it in until it clicks into place.

### 10.6.2 HBO 50 Light Source

**Purpose** The HBO 50 light source serves as a light source for the reflected light process using a fluorescence lamp.

**Position** The HBO 50 is installed on the reflected light port on the backside of the stand.

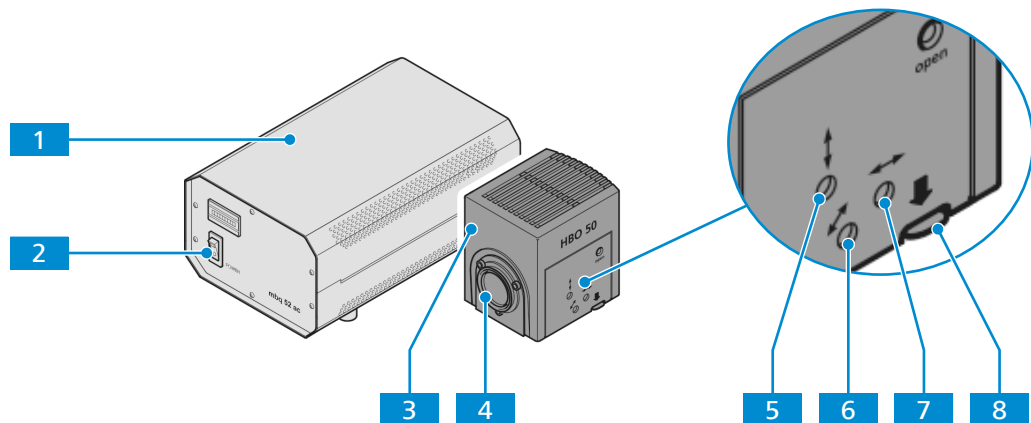


Fig. 67: HBO 50

- |                                      |                           |
|--------------------------------------|---------------------------|
| <b>1</b> Power supply unit (PSU)     | <b>2</b> Main switch      |
| <b>3</b> Lamp housing                | <b>4</b> Dovetail ring    |
| <b>5</b> Vertical adjustment screw   | <b>6</b> Adjustment screw |
| <b>7</b> Horizontal adjustment screw | <b>8</b> Unlocking button |

#### 10.6.2.1 Assembling the HBO 50 Light source

**Parts and Tools**  Hex Key, 3.0 mm

- Prerequisite**
- ✓ The microscope is switched off.
  - ✓ The HBO 50 light source is switched off.

- Procedure**
1. At the illumination mount on the rear side of the stand, loosen the clamping screw.
  2. Remove the protective cap.
  3. Insert the light source's dovetail ring into the illumination mount.
  4. Fasten the clamping screw.

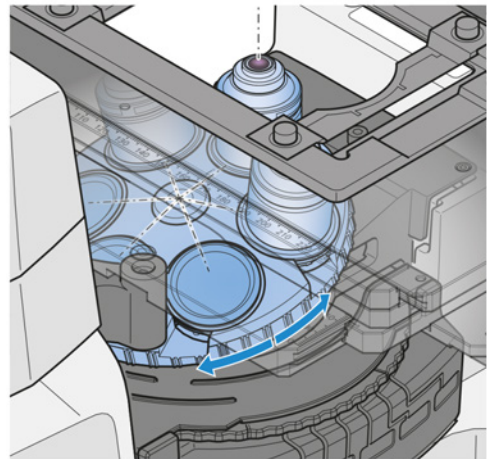
5. Insert the light source's power supply cable into the corresponding socket at the light source's power supply unit (PSU). Fasten the connector's coupling ring.
6. Insert the PSU's mains cable into the corresponding socket at the PSU connector panel.
7. Insert the PSU's mains cable into the operation site's power outlet.

Proceed in the reverse order for removal.

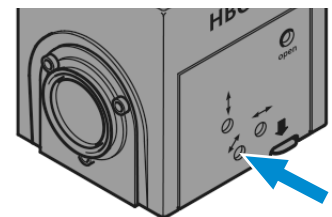
### 10.6.2.2 Adjusting the HBO 50 Light Source

- Prerequisite**
- ✓ The HBO 50 light source is installed [▶ 161] on the microscope.
  - ✓ The microscope is operational.
  - ✓ One objective position is free.

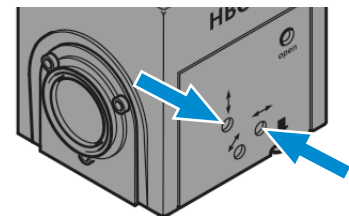
- Procedure**
1. Bring the free objective position into the beam path.



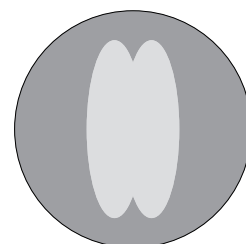
2. If required, remove the cover cap from the free objective position.
3. Insert a filter set for GFP.
4. Switch on the HBO 50 light source on the PSU.
  - The burner ignites automatically.
5. Hold a sheet of paper approximately 10 mm above the objective opening.
  - Two light arcs are visible on the sheet of paper.
6. Using the adjustment screws, set the burner in axial direction to the mirror until the two light arcs on the source image appear equally sized.



7. Using the height and lateral adjustment screws, position the light arc and the mirror image parallel to one another.



- The light arc and the mirror image overlap by one third.



### 10.6.3 X-Cite Xylis® Light Source

**Purpose** The X-Cite Xylis® liquid light guide coupled light source delivers a broad spectrum of excitation light for many fluorescence applications.

**Position** The X-Cite Xylis® light source is connected to the microscope by a light guide and an illumination adapter.

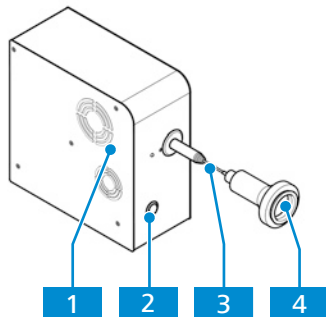


Fig. 68: X-Cite Xylis® light source

**1** X-Cite Xylis® light source

**2** Power switch

**3** Light guide

**4** Illumination adapter

### 10.6.4 Assembling a Colibri 5 or Colibri 7 Light Source

#### Info

For installing the Colibri 5 or Colibri 7 light source, consult the instruction manual supplied with the light source.

### 10.6.5 HXP 120 V Light Source

The Compact Light Source HXP 120 V produces light of very high intensity and couples the light in the optical fiber, preferably liquid optical fiber with an active diameter of 3 mm.

#### Info

Refer for further information to the instruction manual of the HXP 120 V.

#### 10.6.5.1 Assembling the HXP 120 V Light Source

- Procedure**
1. Place the light source on the table.
    - The front side with the operating and display elements must be freely accessible and visible. **NOTICE** The ventilation slots on the sides and the rear panel of the device must not be covered; a free space of at least of at least 150 mm must be maintained in the area of the ventilation slots.
  2. Connect the plug-in power supply to the mains power supply.
  3. Refer to the instruction manual of the HXP 120 V for further installation steps.

## 10.7 Gliding Stage Z

### Info

For additional information and detailed descriptions, refer to further applicable documents or ask your ZEISS Sales & Service Partner.

**Purpose** Mechanical stages are used for fixing and positioning the sample for examination.

**Position** The Gliding stage Z is mounted directly onto the stand.

The following features and controls are available:

- screws and rotation wheel for coarse and fine adjustment
- suitable for use with d = 24 and d = 48 stage inserts

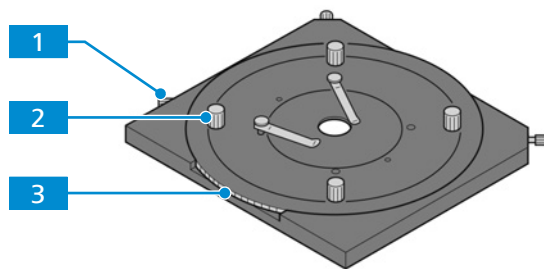


Fig. 69: Gliding stage Z

- |                                 |                  |
|---------------------------------|------------------|
| <b>1</b> Fine adjustment screws | <b>2</b> Handles |
| <b>3</b> Rotation wheel         |                  |

**Function** The sample is fixed on the stage by means of a stage insert.

No.	Description
<b>1</b>	<ul style="list-style-type: none"> <li>▪ fine adjustment of the second layer to find the center position</li> <li>▪ adjust the x-y plane</li> </ul> <p>If the screws <b>1</b> are fixed, the rotation wheel <b>3</b> cannot move.</p>
<b>2</b>	<ul style="list-style-type: none"> <li>▪ displace the top layer of the stage.</li> <li>▪ coarse adjustment of the top layer to find the center position</li> </ul>
<b>3</b>	<ul style="list-style-type: none"> <li>▪ rotate the second layer of the stage</li> </ul> <p>If the screws <b>1</b> are fixed, the rotation wheel cannot move.</p>

### 10.7.1 Assembling the Gliding Stage Z with Stage Inserts

#### NOTICE

##### Property damage due to collision of stage and objective

When this stage is installed, the objective and the stage can collide when rotating the nose-piece.

- ▶ Move the nosepiece to the lowest position possible before rotating it.

- Parts and Tools**
- 🔧 3 x Spacer disk
  - 🔧 Hex Key, 3.0 mm

**Prerequisite** ✓ The nosepiece is in the lowest position.

- Procedure**
1. At the stage's bottom side, unmount the three support elements.
  2. Place a spacer disk on each of the mounting holes at the stand.
  3. Set down the stage on the stand, matching its mounting holes to those of the stand.
  4. Fix the stage to the stand with a screw in each of the stage's three mounting holes.

Proceed in the reverse order for removal.

### 10.8 Assembling the Heating Stage S1

#### NOTICE

##### Property damage due to collision of stage and objective

When this stage is installed, the objective and the stage can collide when rotating the nose-piece.

- ▶ Move the nosepiece to the lowest position possible before rotating it.

- Parts and Tools**
- 🔧 3 x Spacer disk
  - 🔧 Hex Key, 3.0 mm

**Prerequisite** ✓ The nosepiece is in the lowest position.

- Procedure**
1. Place a spacer disk on each of the mounting holes at the stand.
  2. Set down the stage on the stand, matching its mounting holes to those of the stand.
  3. Fix the stage to the stand with a fixing screw in each of the stage's three mounting holes.
    - Ensure that each screw passes through the hole in the relevant spacer disk.
  4. Connect the plug of the stage's cable to the controller (see separate manual).

Proceed in the reverse order for removal.

# 11 Revision History

Revision	Date of Issue	Introduced Modifications
5	04/2023	<ul style="list-style-type: none"><li>Implementation of KC marking</li></ul>
4	01/2023	<ul style="list-style-type: none"><li>Editorial rework</li></ul>
3	01/2023	<ul style="list-style-type: none"><li>Topic <i>Light Manager</i> [<a href="#">▶ 51</a>] added.</li></ul>
2	12/2022	<ul style="list-style-type: none"><li>Editorial rework</li><li>Implementation of UKCA marking</li></ul>
1	04/2022	<ul style="list-style-type: none"><li>Implementation of revision history</li><li>Adaptation to Regulation (EU) 2017/746 (IVDR)</li></ul>

Tab. 5: Revision History

## Glossary

### BF (Brightfield)

Illumination and imaging system where direct light passes through the objective aperture and provides a bright background against which the image is viewed.

### Carrier for transmitted-light illumination

Fixture to carry a light source for transmitted-light illumination

### C-DIC

Differential Interference Contrast in circularly polarized light, a contrast method which employs the differential interference contrast technique with circularly polarized light, thus fully imaging sample structures which otherwise are only visible in a certain orientation

### DF (Darkfield)

Illumination and imaging system that prevents direct light from entering the objective aperture.

### DIC (Differential Interference Contrast)

An imaging light microscopy method that converts differences in the optical path length in the object into differences in the brightness of the image

### EMC (Electromagnetic compatibility)

Ability of equipment to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to other equipment in that environment.

### EMI

Electromagnetic Interference

### EMS

Electromagnetic Susceptibility

### FL (Fluorescence)

Phenomenon of a selective absorption of radiation with relatively short wavelength (i.e., relatively high energy) by matter with the result of the emission of radiation with longer wavelengths (i.e., lower energy), which persists only very briefly after the excitation has ceased.

### Focus drive

Control to adjust the spacial relation of specimen and optics along the beam path

### GFP (green fluorescent protein)

A fluorescent protein that exhibits bright green fluorescence when exposed to light in the blue to ultraviolet range.

### HDMI (High Definition Multimedia Interface)

A digital interface for audio and video that is capable of transmitting high-quality and high-bandwidth streams of audio, video, and signal data (e.g. control signals) between devices.

### iHMC

Improved Hoffman Modulation Contrast

### Illumination mount

A fixture designed to hold an external illumination unit

### LED (Light emitting diode)

Solid state device embodying a p-n junction, emitting optical radiation when excited by an electric current.

### Light Manager

Light Manager. An automatic adjustment of the optimal light intensity when changing a component (e.g. an objective, etc.).

### MTB (MicroToolBox)

The software MTB is used to generate and manage microscope configurations. Information about microscope components (e.g. nosepieces, reflector turrets, shutters etc.) and, if necessary, additional external units (e.g. motorized xy stages, external light sources etc.) is stored in these configurations. Furthermore, the software can also be used to enter information about microscope components, such as objectives, fluorescence filter cubes etc., in a simple way and to save this information in the microscope (depending on the type of microscope in question). In this case, the information is saved directly in the microscope, allowing it to be displayed on the microscope's

TFT screen, for example. Various configurations can be created, of which only one is activated at any time. The active configuration is used by imaging software such as ZEN to provide graphic control dialogs for the configured microscope units (e.g. lightpath or microscope components control).

**OSD**

On Screen Display

**PCBA**

Printed Circuit Board Assembly

**Ph (Phase contrast)**

Method in which, for example, differences in density in very thin samples are made visible by converting the phase shift through the object into a change in amplitude.

**PlasDIC**

Differential Interference Contrast for Plastic Receptacles

**PSU**

Power supply unit. Chiefly used for combinations of transformers and rectifiers that convert AC mains power to a lower-voltage DC power used in electronic devices. Superordinate concept -- see cross reference for specific types.

**RF**

Radio Frequency

**RL (Reflected Light)**

Designation for microscopy techniques to image light that was reflected by the object

**SCB**

Smart Control Box

**TIC (Total Interference Contrast)**

Total Interference Contrast in circularly polarized light is a technique for imaging and layer thickness measurement in materials microscopy. Contrary to traditional polarization interferometers, work in this technique is carried out in circularly polarized light.

**TL (Transmitted light)**

Light used for illuminating a object, where the light is transmitted through the object.

**UDI**

Unique device identifier

**ZEISS Sales & Service Partner**

The Sales & Service Partner is generally in the field for customer support in a regional area and / or a clearly defined customer group.

**ZEISS service representative**

Specially trained service expert, either ZEISS staff or authorized service partner of ZEISS.

**ZEN**

ZEISS Efficient Navigation



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