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Illumination System Colibri.2

Operating Manual

Knowledge of this manual is required for the operation of the device. You are therefore requested to familiarize yourself with its content and pay special attention to the instructions regarding the safe handling of the device.

We reserve the right to make changes in the interest of further technical development. This manual is not subject to an update service.

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Issued by:

Carl Zeiss Microscopy GmbH
Carl-Zeiss-Promenade 10
07745 Jena, Germany

microscopy@zeiss.com
www.zeiss.com/microscopy



Carl Zeiss Microscopy GmbH
Königsallee 9-21
37081 Göttingen, Germany

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1 INTRODUCTION

1.1 Notes on device safety

The Colibri.2 illumination system has been designed, produced and tested in compliance with the DIN EN 61010-1 (IEC 1010-1) standard - safety requirements for electrical measuring, control and laboratory instruments. It meets the EC requirements 2006/95/EC - Low-Voltage Directive - and 2006/95/EC - Electromagnetic Compatibility. The device has to be disposed of in accordance with the WEEE Directive 2012/19/EC.

It is marked with the CE sign.

The present manual contains information and warnings that have to be observed by the operator.

The warning and note symbols used in this manual are described below:



CAUTION
This symbol indicates possible danger to the operator.



WARNING of possible laser radiation!
The safety screws on the lamp module and Colibri.2 illumination adapter may only be removed by Carl Zeiss Service (not a customer interface). Otherwise there is a risk of eye damage upon laser coupling.



WARNING of possible laser radiation!
The safety ring on the fiber coupling of the HXP light source may not be removed (not a customer interface). Otherwise there is a risk of eye damage upon laser coupling.



CAUTION LED radiation!
LED risk group 3 according to DIN EN 62471:2009 when the user looks directly into the Colibri.2 light output.
UV radiation is emitted.
Any direct looking into the Colibri.2 light output is to be avoided.
Failure to heed this caution may result in eye damage.
Skin and eye irradiation is to be minimized by appropriate shielding.



CAUTION: High-energy UV radiation!
Risk of damage to the eyes and skin!



CAUTION
Disconnect the device from the line before any intervention!



ATTENTION
This symbol indicates possible danger to the device or device system.



NOTE
This symbol marks notes the operator must pay special attention to.

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The Colibri.2 illumination system is usually attached to the microscope stand.
Depending on the design of the microscope, the risk for the user must be assessed as being markedly lower then.

When it comes to the intended use of the Axio Examiner microscope with Colibri.2, for example, the risk status of the overall system is downgraded to LED risk group 2 according to DIN EN 62471:2009.

The Colibri.2 illumination system including its original accessories may only be used for the purposes described in this operating manual.

Particular attention must be paid to the following notes:



Use the illumination system for Carl Zeiss microscopes only.
The manufacturer cannot assume liability for any other applications, including that of individual modules or single parts. This also applies to any service or repair work that is not carried out by authorized service personnel. All warranty claims shall be forfeited.



To ensure safe operation of the illumination system in connection with the microscope, please pay attention to the operating manual of the microscope.



Do not operate the Colibri.2 illumination system in explosion-prone areas.



Keep combustible and easily inflammable materials away from the light beam and its surroundings.



The Colibri.2 illumination system is not equipped with any special devices for protection from substances that are corrosive, potentially infectious, toxic, radioactive, or other substances that could be hazardous to health. When handling such substances make sure that all legal regulations, particularly the relevant national accident prevention regulations, are observed.



The power plug of the control unit must be inserted in an outlet featuring a grounding (earth) contact. The grounding effect must not be made ineffective by an extension cable that does not have a protective ground wire.





When protection measures are found to be no longer effective, the instrument must be switched off and safeguarded against inadvertent operation. For repair please contact the Carl Zeiss Microscopy Service in Germany (see page 40) or your local Carl Zeiss representative.

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Before switching on the control unit please check whether it is suitable for the available line voltage. Disconnect the power plug of the control unit before opening the device and before changing the fuses!
Take care that only fuses for the rated power are used. Use of makeshift fuses and short-circuiting of the fuse holders are not permitted.



The lamp module, if equipped with the corresponding LED modules or if a white light source coupled by a liquid light guide is used, emits ultraviolet radiation that may cause burns to the eyes and skin. Therefore, never look directly into the light and avoid direct incidence of the light on your skin. When operating the microscope, always use the protective devices belonging to the instrument.



Never look into the light beam – neither with nor without optical instruments, even not if you simply want to observe the specimen. Your eyes may be damaged in case of non-observance!



Placing objects against or covering ventilation slats of the control unit may lead to heat build-up that may damage the device and, in extreme cases, cause a fire. Always keep the ventilation slats clear and ensure that no objects enter the device through the ventilation slats.



Dirt and dust may impair the performance of the device. Therefore, the device must largely be protected from these influences and covered with the dust cover when not being in use. Before covering the device, please make sure that it has been switched off.



Take appropriate protective measures if the specimen releases noxious gases, dust, and vapors, secondary radiation or explosive substances as a result of the UV radiation!



If an external white light source (e.g. HXP 120 V) is used in connection with Colibri.2, never look directly into the light guide output of the white light source to avoid the risk of being dazzled and going blind.

The white light source must not be switched on until after having connected the output of the liquid light guide tightly with the Colibri.2 system.



When using the white light source HXP120 V, please pay attention to the manufacturer's operating instructions.

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Opening the Colibri.2 Controller housing is only permitted to authorized service personnel.



The bulb of the external white light source has to be changed according to the operating instructions of the manufacturer of the white light source. Otherwise there is danger of burns and explosion when changing the bulb.



Defective devices must not be disposed of with the household waste. Dispose them of in compliance with the relevant legal requirements or return them to the manufacturer of the device.



The manufacturer of the device is under the legal obligation to take defective devices back.

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1.2 Warning labels

Standard labeling

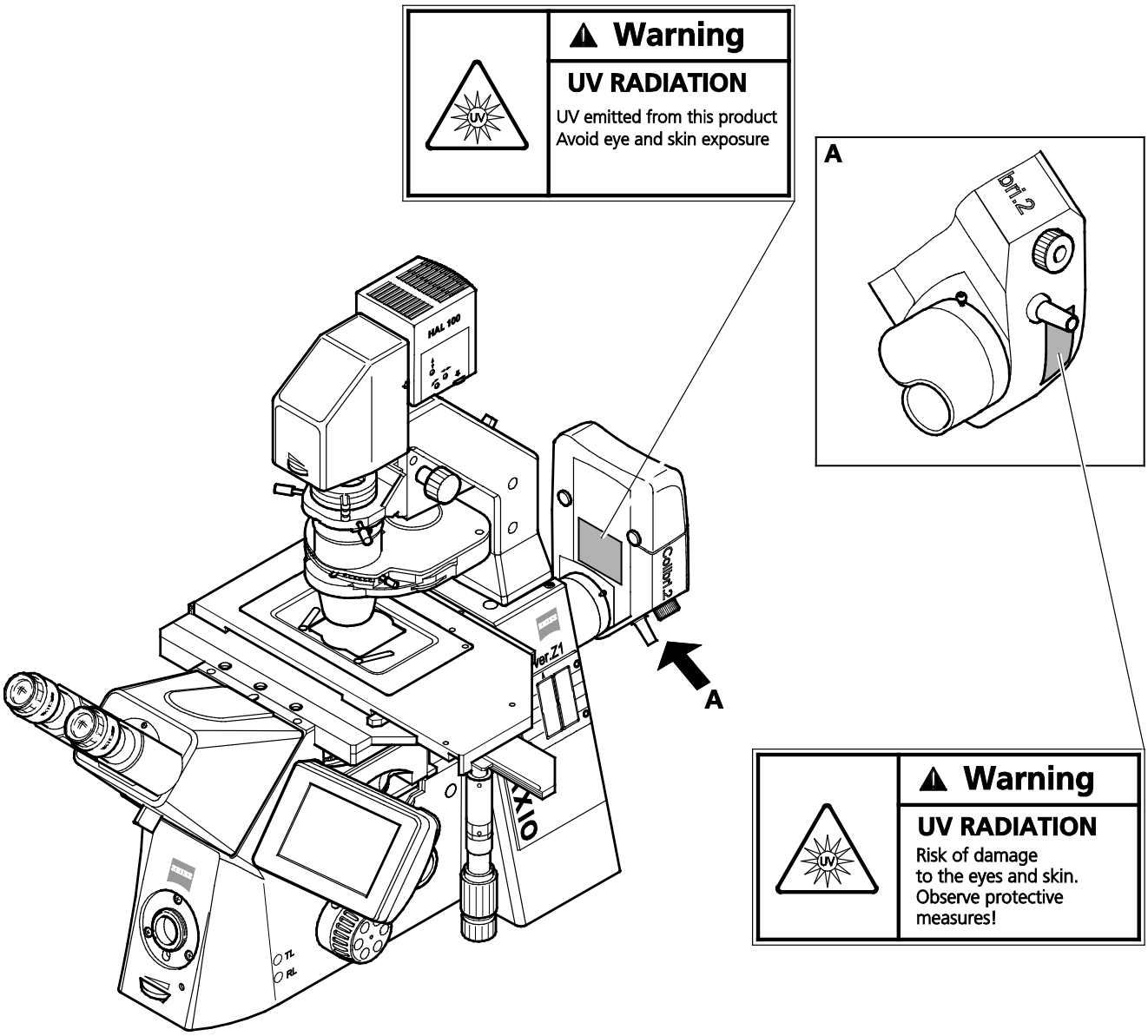


Fig. 1-1 Warning labels on the Colibri.2 illumination system

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Labels on the lamp module and Colibri.2 illumination adapter for laser application.

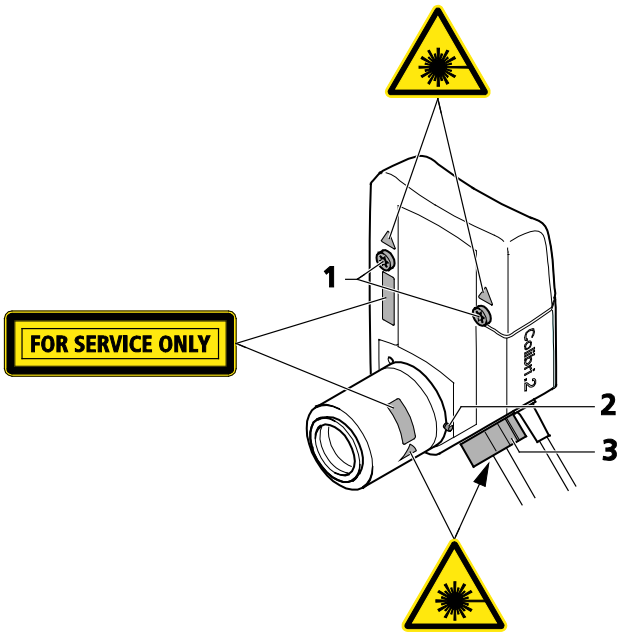


Fig. 1-2 Warning labels and safety components on the Colibri.2 illumination system for laser applications

The safety screws (Fig. 2-1/**1** and **2**) on the lamp module and Colibri.2 illumination adapter may only be removed by Carl Zeiss Service (not a customer interface). Otherwise there is a risk of eye damage upon laser coupling.

The safety ring (Fig. 2-1/**3**) on the fiber coupling of the HXP light source may not be removed (not a customer interface). Otherwise there is a risk of eye damage upon laser coupling.

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1.3 Warranty notes

The manufacturer guarantees that the device is free from material and manufacturing defects when delivered. Any defects have to be reported to us immediately and everything possible has to be done to minimize the damage. In the event that such a defect has been reported, the manufacturer is obligated to remedy it to its discretion by repairing the defective device or by delivering a perfect one. No guarantee is provided for defects caused by natural wear (wearing parts in particular) and improper use.

The manufacturer of the device is not liable for damage caused by faulty operation, negligence or any other tampering with the device, in particular as a result of removing or exchanging device components, or the use of accessories from other manufacturers. This forfeits all claims against warranty.

With the exception of the work specified in this manual, no maintenance or repair work to the microscopes may be performed. Repairs are only allowed to the Carl Zeiss service staff or specially authorized personnel. Should any defect occur, please contact first the Carl Zeiss Microscopy Service in Germany (see page 40) or your local Carl Zeiss representative.

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2 DESCRIPTION

2.1 Name, intended use, and main features

Manufacturer's designation: Colibri.2 Illumination System

The Colibri.2 illumination system is designed to be used as a light source for reflected light fluorescence applications. It can be used in connection with the upright microscopes Axio Imager, Axioplan 2, Axioskop 2, Axioskop 2 FS, Axioskop 40, as well as with the inverted microscopes Axio Observer and Axiovert 200.

Major features are:

- High-end LED light source for fluorescence applications with visible and UV light for direct connection to the microscope
- Excellent contrast properties
- Up to four LED modules with different emission wavelengths can be used individually or combined in the lamp module
- LED modules are exchangeable, at present ten different LED modules are available
- No alignment required
- LED modules are equipped with a chip for automatic component recognition (ACR)
- LED emission is individually adjustable for every LED in one-percent steps
- Very quick switching on, over and off of the LED modules, no shutter required
- Optoelectronic switchover between LED modules, no mechanical movements
- Very long life time
- Minimum heat development
- Changeable beam combiners for the configuration of the light path in the Colibri.2 lamp module
- Specific filter sets (as P&C filter modules and separate excitation filters) for the LED modules deliverable
- Motorized interface for fiber coupling of an external white light source

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2.2 Components overview

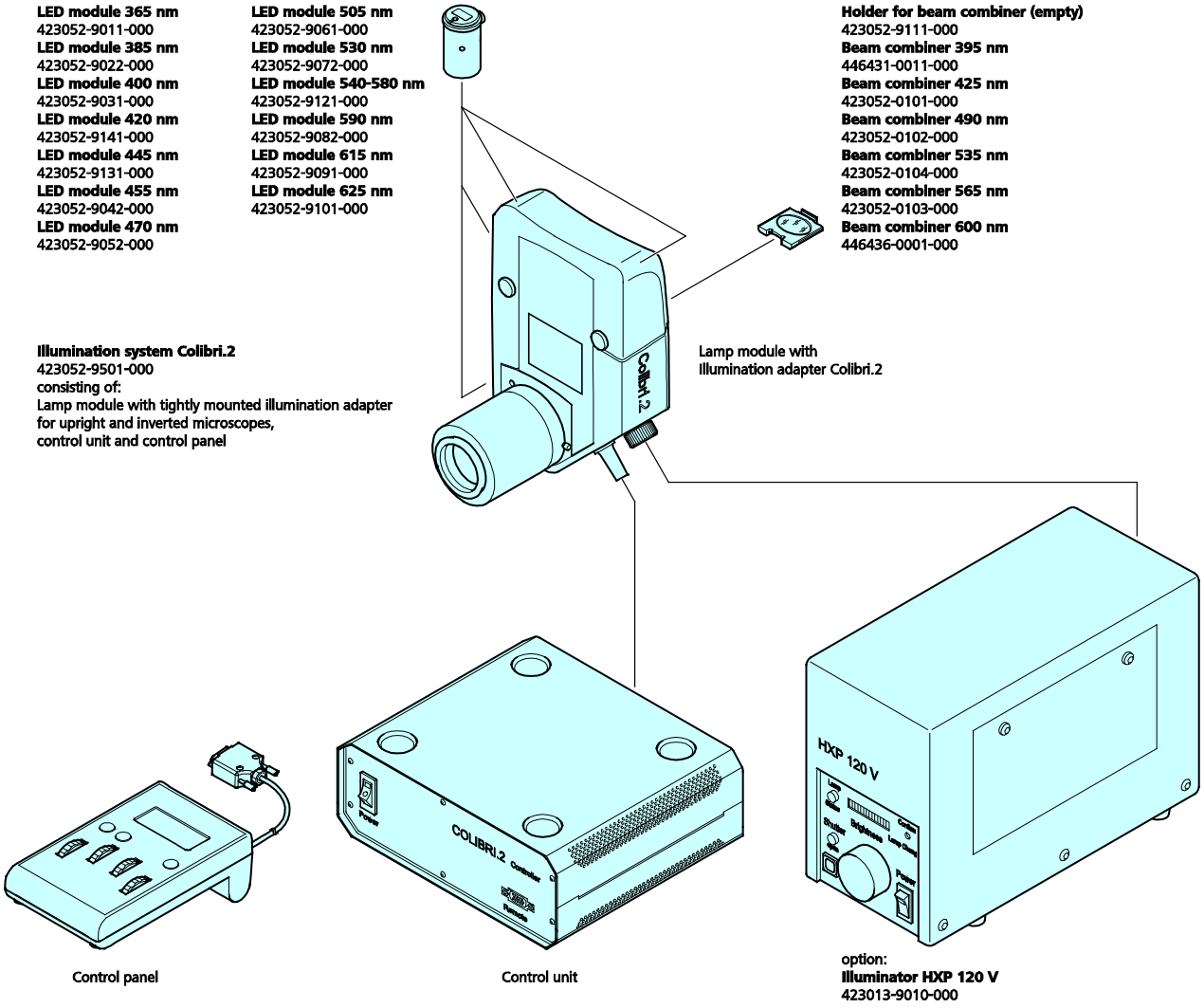


Fig. 2-1 Components overview of the Colibri.2 illumination system

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2.3 Technical data

Dimensions

Lamp module (length × width × height) ..... 240 mm x 155 mm x 75 mm
Control unit (length × width × height)..... 225 mm x 250mm x 95 mm
Control panel (length × width × height) ..... 178 mm x 108 mm x 64 mm
LED module (length × diameter).....53 mm x 31 mm
Illumination adapter (length × diameter).....86 mm x 78 mm

Weight

Lamp module.....approx. 2400 g
Control unit .....approx. 2600 g
Control panel..... approx. 460 g
LED module ..... approx. 75 g
Illumination adapter ..... approx. 550 g

Ambient conditions

Transport (in packaging):
Permissible ambient temperature.....-40 to +70 °C

Storage:
Permissible ambient temperature.....+10 to +40 °C
Permissible relative humidity (without condensation)..... max. 75 % at 35 °C

Operation:
Permissible ambient temperature.....+10 to +40 °C
Permissible relative humidity (without condensation)..... max. 75 % at 35 °C
Altitude of installation site.....max. 2000 m
Atmospheric pressure .....800 hPa to 1060 hPa
Pollution degree 2

Operating data

Operating environment ..... closed room
Protection class I
Protection type..... IP 20
Electrical safety..... in compliance with DIN EN 61010-1 (IEC 61010-1)
..... including CSA and UL directives
Overvoltage category.....II
Radio interference suppression .....in accordance with EN 55011 Class B
Noise immunity .....in accordance with DIN EN 61326
Line voltage range of control unit .....100 to 240 V AC (± 10 %)
Line frequency.....50 to 60 Hz
Power consumption of control unit..... 70 VA

Fuses according to IEC 60127

Control unit .....T 2.5 A/H; 250 V; 5 X 20 mm

Colibri.2 overall LED classification:..... LED risk group 3 according to DIN EN 62471:2009
LED module 365 nm..... LED risk group 3 according to DIN EN 62471:2009
LED module 470 nm..... LED risk group 1 according to DIN EN 62471:2009
LED module 619 nm.....No LED risk group according to DIN EN 62471:2009

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3 START-UP

The Colibri.2 illumination system consists of the following main parts:

- Colibri.2 lamp module
- Control unit
- Control panel

The device can be assembled by the customer.

The lamp module is completely mounted according to customers' order, including LED modules and beam combiners. If necessary, the LED modules and beam combiners can be changed quickly and easily by the customer (see Section 5).

3.1 Unpacking the illumination system

The lamp module, the control unit and the control panel, as well as the optional accessories are supplied separately in customary packaging.

Remove all parts from the packaging and check them for completeness according to the delivery note.

For use with confocal Laser Scanning Microscopes the illumination system Colibri.2 (Fig. 3-1/**1**) is delivered with tightly mounted illumination adapter (Fig. 3-1/**2**).

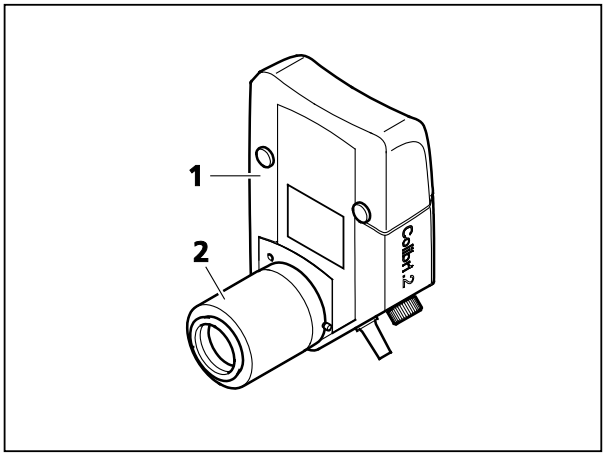


Fig. 3-1 Attaching the illumination adapter

☞ For laser safety reasons the connection between illumination adapter and lamp module is no customer interface. Disregard results in losing laser safety of the system.

The Colibri.2 lamp module can be only used with the upper part of its housing properly mounted. As soon as the upper part of the housing is removed, a safety switch (interlock) will switch off the LED modules.

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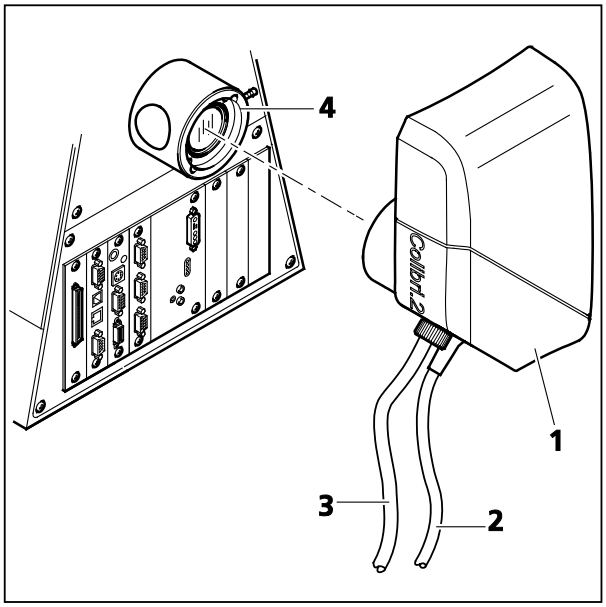


Fig. 3-2 Attaching the lamp module

3.2 Attaching the lamp module, connecting the control unit and the control panel

The lamp module operates via the illumination mount (reflected light) of the microscope.

- Attach the lamp module (Fig. 3-2/**1**) via the dovetail of the illumination adapter to the reflected light mount (Fig. 3-2/**4**) of the microscope and fasten it by means of the clamping screw.

The lamp module does not require any adjustment.

- Connect the lamp module cable (Fig. 3-2/**2**) to the 25-pin subD port of the control unit (see Fig. 3-7/**4**).
- Connect the connection cable of the control panel (see Fig. 3-9/**1**) to the 15-pin subD port of the control unit (see Fig. 3-6/**2**).
- Connect the control unit (see Fig. 3-7/**2**) with the power cable to a power outlet.

An external white light source (e.g. HXP 120 V, see Fig. 3-10) can be connected at the coupling position for liquid light guides as follows:

- Introduce one end of the light guide into the white light source (see Fig. 3-11/**3**) and the other end into the connection point of the lamp module (Fig. 3-2/**3**) and fasten it by means of the swivel nut.
- The internal motorized shutter of the white light source HXP 120 V can be triggered via the 9-pin subD port of the lamp housing. Connect for this purpose the trigger cable with the BNC socket **OUT 1** of the Colibri control unit (see Fig. 3-7/**1**).
- Connect the white light source (see Fig. 3-11/**2**) with a power cable to a power outlet.

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3.3 Connection diagram

3.3.1 Connection diagram for stand-alone operation

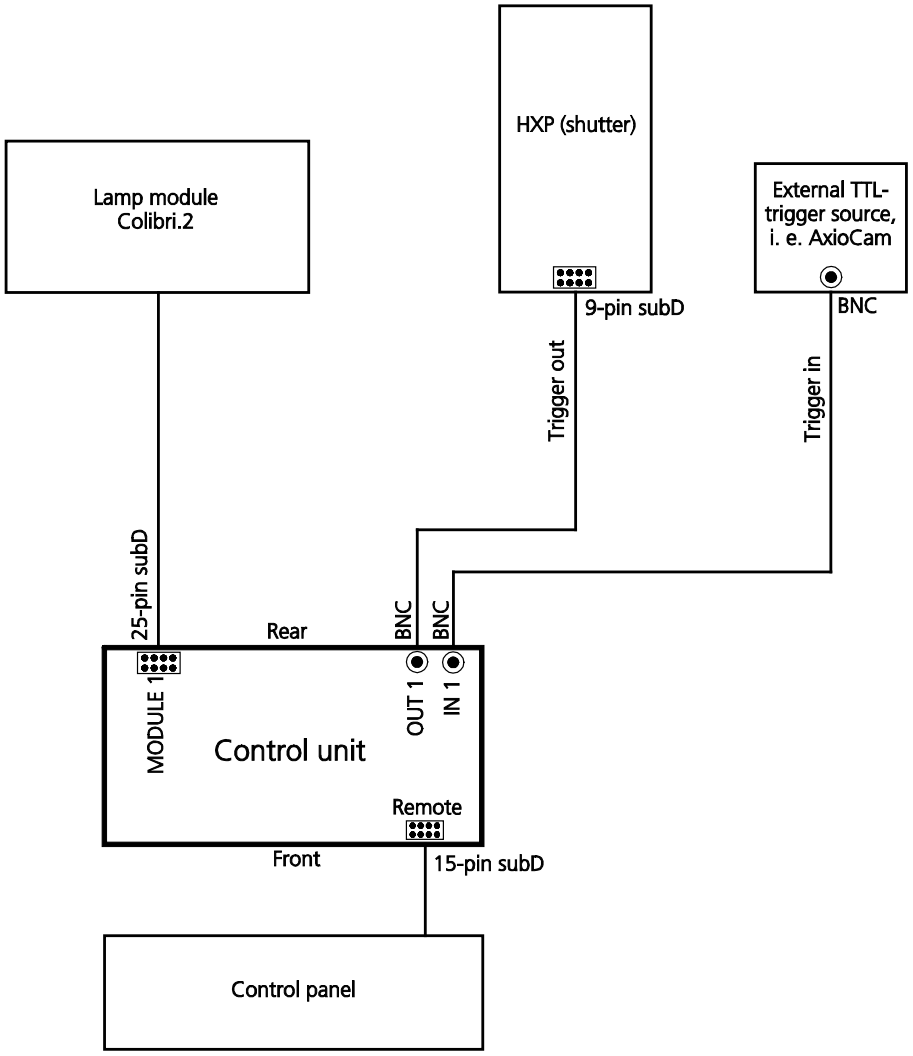
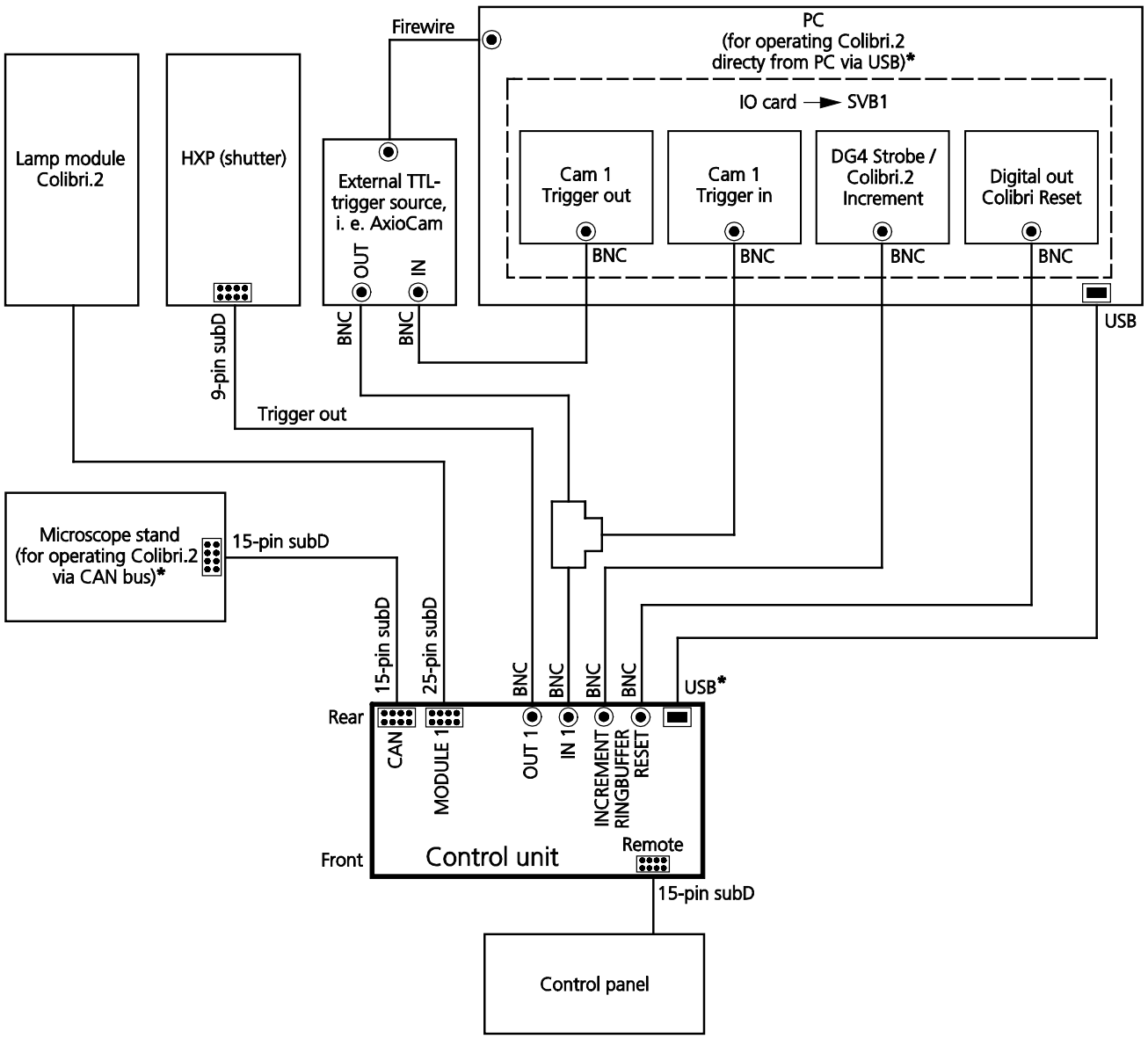


Fig. 3-3 Connection diagram for stand-alone operation

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3.3.2 Connection diagram with PC and motorized microscope for Fast Acquisition



* Colibri.2 can be connected alternatively via USB or via CAN!

Fig. 3-4 Connection diagram with PC and motorized microscope for Fast Acquisition

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3.4 Construction of the illumination system

3.4.1 Colibri.2 lamp module

The Colibri.2 lamp module can be equipped with up to four LED modules (Fig. 3-5/**1**) and three beam combiners (Fig. 3-5/**2**).

The LED modules and beam combiners can be switched by the customer.

When using an additional fiber coupled white light source, it is possible to toggle between the lamp module and the external white light source by means of a motorized built-in switching prism (Fig. 3-5/**3**, covered).

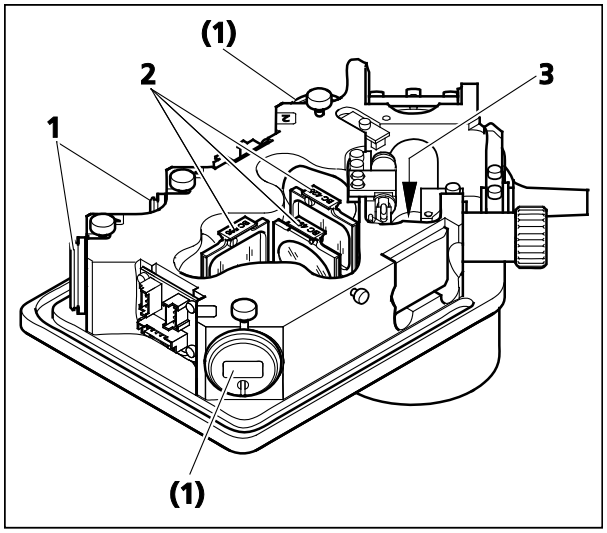


Fig. 3-5 Construction of the lamp module

3.4.2 Control unit

The control unit of the lamp module contains the control and the power electronics.

At the front of the device there is the ON/OFF switch **Power** (Fig. 3-6/**1** with pilot lamp), as well as a 15-pin subD port (Fig. 3-6/**2**) for the control panel.

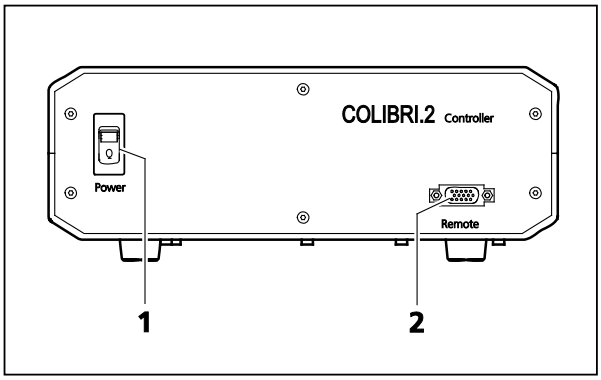


Fig. 3-6 Control unit, front

The rear of the control unit contains:

- several BNC ports; the trigger cable leading to the white light source has to be inserted in **OUT 1** (Fig. 3-7/**1**)
- the power connection socket (Fig. 3-7/**2**)
- two CAN ports (Fig. 3-7/**3**) for the connection to the microscope
- the 25-pin subD port (Fig. 3-7/**4**) for connecting the Colibri.2 lamp module
- the USB port (Fig. 3-7/**5**) for the connection to a PC.

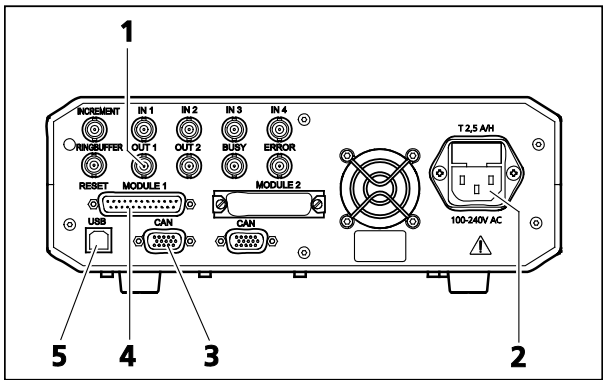


Fig. 3-7 Control unit, rear

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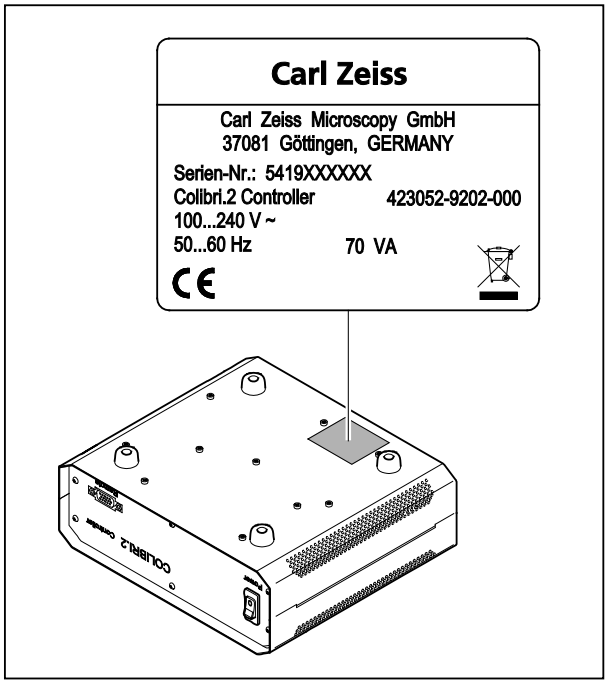


Fig. 3-8 Control unit, bottom

The rating plate is located at the bottom of the control unit.

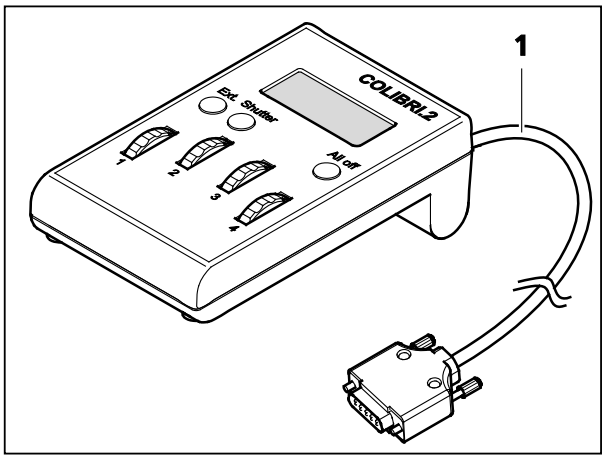


Fig. 3-9 Control panel

3.4.3 Control panel

The control panel can be used to control the LED modules, switch over to the external white light source, and control the shutter of the white light source HXP 120 V.

- The control panel has to be connected to the 15-pin subD port (see Fig. 3-6/**2**) of the control unit via the connection cable (Fig. 3-9/**1**).

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3.4.4 External white light source

At the front of the white light source (illumination system HXP 120 V) there are

- the **Power** switch (Fig. 3-10/**1**),
- the **Brightness** turning knob (Fig. 3-10/**2**) with LED bar graph,
- the **Shutter** button (Fig. 3-10/**3**) with the **Shutter open** indicator (Fig. 3-10/**4**),
- the **Lamp Status** indicator (Fig. 3-10/**5**),
- and the **Confirm Lamp Change** button (Fig. 3-10/**6**).

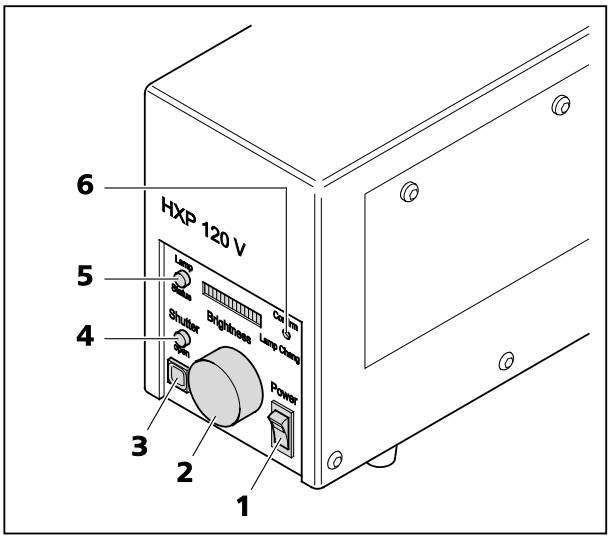


Fig. 3-10 Illumination system HXP 120 V, front

After the lamp has fired, the **Lamp Status** indicator shows the state of the internal operation-hour counter and therefore the age of the lamp in different colors:

Lamp Status indicator	Internal operation-hour counter	Comment
Green	< 2000 hours	
Yellow	> 2000 hours	Prepare lamp change
Red	> 2500 hours	Change lamp
Flashing red		Lamp defective

At the rear there are the power connection socket (Fig. 3-11/**2**) and the fiber optics outlet (Fig. 3-11/**3**).

Besides that, the trigger cable port **Trigger in** (Fig. 3-11/**4**) is situated here. The trigger cable must be used to connect the HXP 120 V to the Colibri.2 control unit, if the shutter should be controlled via the Colibri.2 unit. If the shutter should be controlled by the microscope, the microscope has to be connected to the **CAN** port (Fig. 3-11/**1**) of the HXP 120 V.

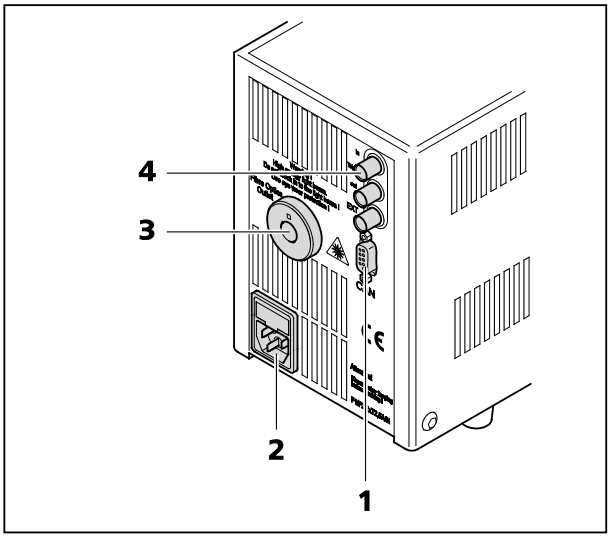


Fig. 3-11 Illumination system HXP 120 V, rear

☞ If the HXP 120 V is used without the Colibri.2 lamp module, an illumination adapter is required to couple the liquid light guide into the reflected light path of the microscope (423302-0000-000 illumination adapter for light sources with light guide).

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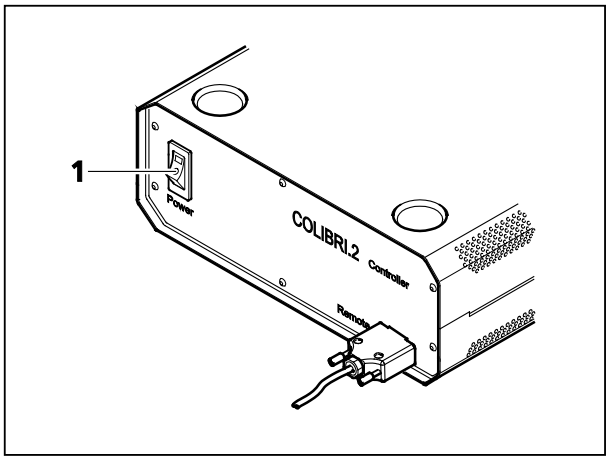


Fig. 4-1 Control unit

4 OPERATION

4.1 Switching on the control unit

- Switch the Colibri.2 illumination system on/off by means of the ON/OFF switch **Power** (Fig. 4-1/**1**) at the front of the control unit.

As soon as the pilot lamp integrated in the switch is illuminated, the lamp module is ready for operation.

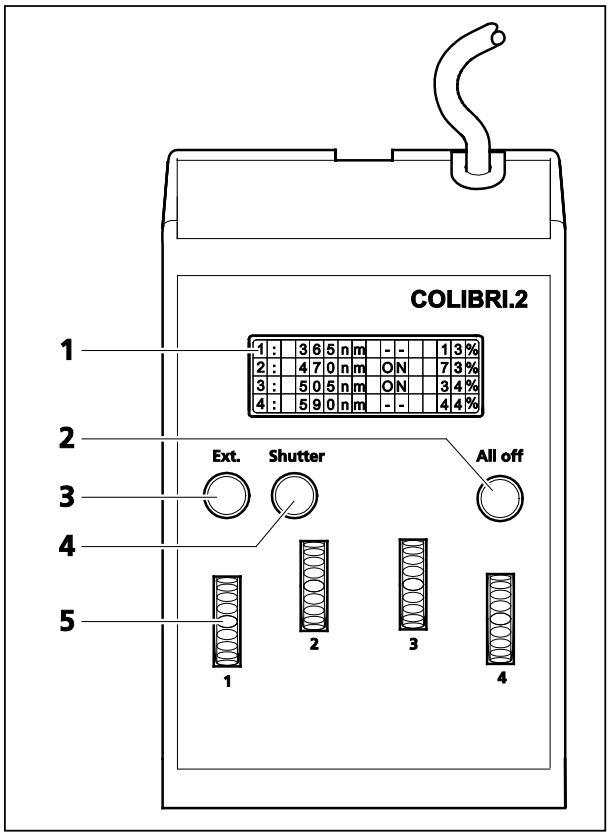


Fig. 4-2 Control panel, with lamp module being controlled

4.2 Functions of the control panel

The control panel is used to control the LED modules, to switch over to the white light source, and to check the shutter of the HXP 120 V.

When switching on the control unit, the system will be initialized, the LED modules present in the lamp module will be identified by ACR (automatic component recognition) and indicated on the 4-line display (Fig. 4-2/**1** and Fig. 4-3/**1**, respectively).

In addition, the intensity for each LED module will be shown in percent and the switching status **ON** and **-** (for OFF) is indicated.

The LED modules are individually switched on/off by pressing the control elements **1** to **4** (Fig. 4-2/**5**) down. These control elements are also used to regulate the intensity by pushing them in the direction of the display or in the opposite direction.

The set brightness will remain temporarily stored even after switching off the respective LED module (i.e. unless the control unit is switched off). When this LED module is switched on again, it will illuminate with the same brightness as it did before it had been switched off.

To switch off all LED modules at the same time, press the **All off** button (Fig. 4-2/**2**).

The **Ext.** button (Fig. 4-2/**3**) is used to switch the prism to the external white light source, and the **Shutter** button (Fig. 4-2/**4**) functions to open/close the shutter of the white light source HXP 120 V. If another white light source is used, the **Shutter** button will have no function.

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The display changes according to whether the lamp module or the external white light source HXP 120 V is used.

With the lamp module active, the wavelength, switching status and the power of the installed LED module is shown (Fig. 4-3/**1**).

Is the white light source active, a display of **Ext Light Source** is shown in line 1. The shutter position of the white light source is symbolized graphically in the lines 2 to 4 (shutter opened: Fig. 4-3/**2**; shutter closed: Fig. 4-3/**3**).

In the event that the upper part of the housing of the lamp module is opened while the device is operating, the LED modules will be switched off automatically. A corresponding message will be displayed on the control panel.

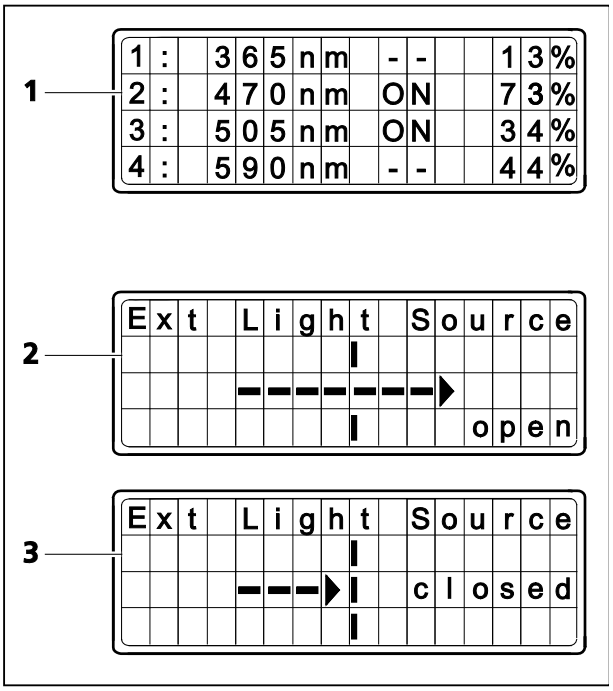


Fig. 4-3 **Various indications on the control panel display when using the Colibri.2 illumination system and the white light source HXP 120 V, respectively**

4.3 Functions of the white light source HXP 120 V

For operating the white light source please pay attention to the manufacturer's separate operating manual as well.

Prior to switching on the white light source please make sure that the liquid light guide has been properly positioned and fixed to the Colibri.2 lamp module.

- Switch on (or off) the external white light source via the **Power** switch (Fig. 4-4/**1**).
- Open or close the shutter by pushing the **Shutter** button (Fig. 4-4/**3**). The **Shutter open** indicator (Fig. 4-4/**4**) shows the operating state of the shutter.
- The brightness of the white light source can be adjusted manually by actuating the turning the knob **Brightness** (Fig. 4-4/**2**).

If the trigger cable has been connected to the Colibri.2 control unit, the shutter can also be opened/closed via the control panel.

The control panel, however, cannot be used to regulate the intensity of the white light source.

To change over from white light source to LED modules and vice versa, the **Ext.** button located at the control panel has to be pressed down.

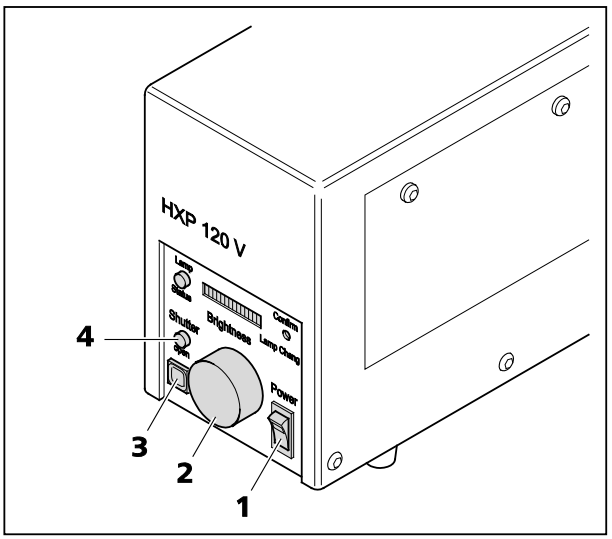


Fig. 4-4 **Illumination system HXP 120 V, front**

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5 MODIFYING THE LAMP MODULE

Unplug the power plug of the microscope, the control unit and the connected white light source from the power supply before mounting/dismounting the lamp module to or from the microscope and before carrying out any modification! Disconnect the power plug of the control unit as well before changing the fuses!
Make sure that only fuses for the rated power are used. Use of makeshift fuses and short-circuiting of the fuse holders are not permitted.

The lamp module is provided with an interlock switch that will disconnect the illumination system immediately as soon as the upper part of the housing is removed.

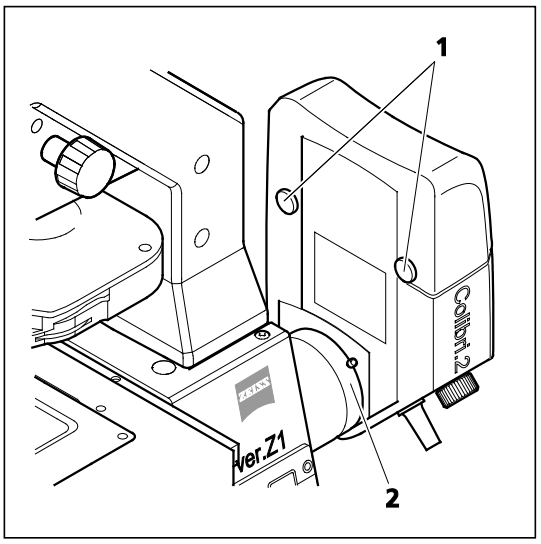


Fig. 5-1 Loosening fastening screws

5.1 Removing the lamp module from the microscope and opening it

- Hold the lamp module firmly, loosen the clamping screw at the microscope coupling or at the illumination adapter (Fig. 5-1/**2**) using the SW 3 ball-headed screwdriver and remove the lamp module.
- Loosen both fastening screws (Fig. 5-1/**1**) at the lamp module.

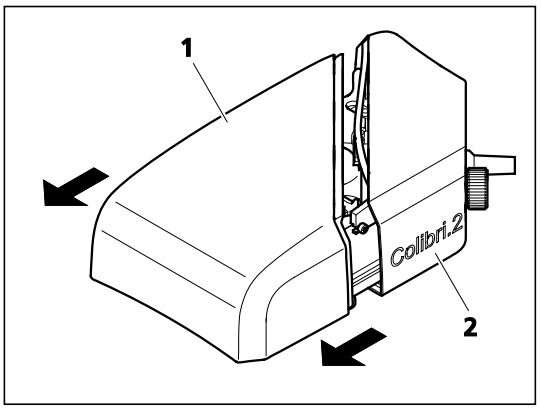


Fig. 5-2 Removing the upper part of the housing

- Place the lamp module safely on a suitable base.
- Pull off the upper part 1 of the housing (Fig. 5-2/**1**) upwards (the upper part 2 (Fig. 5-2/**2**) is firmly joined with the lower part and cannot be removed).

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5.2 Inserting or changing LED modules

☞ To make them distinguishable, the LED modules are provided with adhesive labels where wavelength and part number are indicated. The mounts for the LED modules are marked with the position numbers ① to ④, corresponding to the numbers (1 to 4) on the control panel. If all LED modules are to be mounted, they should be inserted according to increasing wave lengths, beginning with position①.

According to how the LEDs are combined, many different configurations are possible. Some configuration proposals are given in the overview of chapter 7.

- Insert the LED module (Fig. 5-3/**1**) into the mount up to the stop position (here, for example, the mount for channel ③).
- Tighten the knurled screw (Fig. 5-3/**2**) slightly to hold the module in place.
- Connect the cable of the LED module (Fig. 5-3/**3**) to the corresponding socket. With the LED module inserted, the cable length allows only one plug-in position.
- Proceed in reverse order to dismount it: Press the clip of the plug and remove the cable from the socket. Loosen the knurled screw and pull the LED module out of the mount by pulling on the knurled screw.
- Do not pull the connection cable to remove the LED module.
- No adjustment is required after changing LED modules or beam combiners.

☞ The bandwidth of an LED module can be restricted by using an excitation filter (diameter 25 mm). The filter has to be fixed by a retaining ring.

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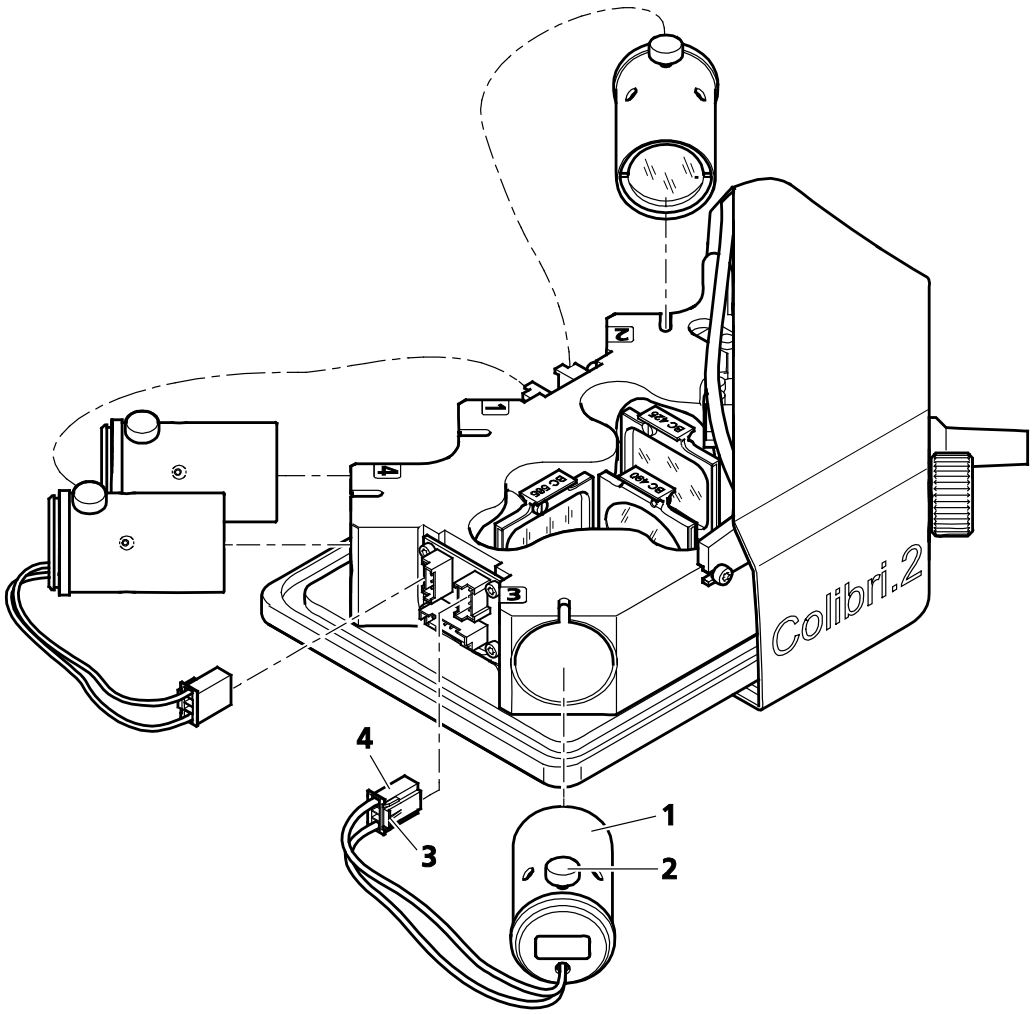


Fig. 5-3 Inserting an LED module into the lamp module

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5.3 Inserting or changing a mounting frame with beam combiner

- Hold the mounting frame (Fig. 5-4/**1**) by the grip and insert it from above into the corresponding seat (Fig. 5-4/**2**) of the lamp module until it locks in place (point of pressure). Avoid tilting the mounting frame to prevent damage.
- To change the mounting frame, hold it by the grip and remove it carefully upwards.
- The mounting frames are provided with an adhesive label indicating the wavelength of the inserted beam combiner (e.g. BC 490 for beam combiner 490 nm).

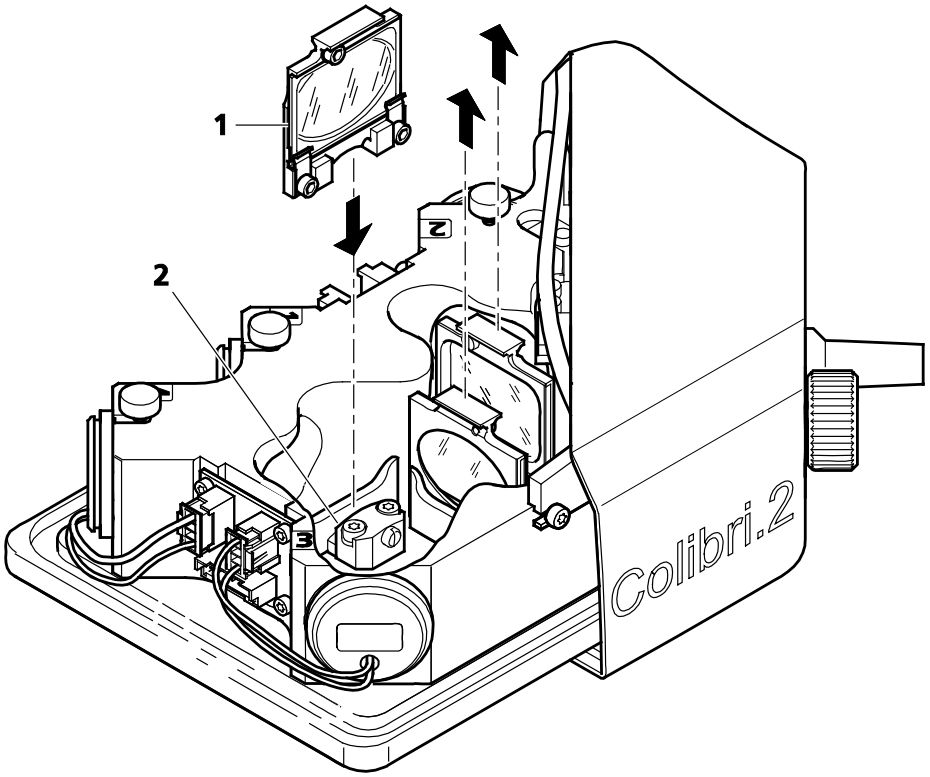


Fig. 5-4 Changing a mounting frame with beam combiner

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5.4 Inserting the beam combiner into the mounting frame or changing it

Different beam combiners are available to be inserted into the mounting frames marked with the corresponding wavelength designations.

The beam combiners are designed as high passes, which means that shorter wavelengths than that indicated for the beam combiner are reflected, while longer wavelengths can pass. For configuration proposals of LED modules and beam combiners see also chapter 7.

If both are ordered, the mounting frame will be delivered with the beam combiner already inserted.

If another beam combiner is required, an additional, empty mounting frame (423052-9110-000, mounting frame for beam combiner) must be ordered or an already mounted beam combiner must be dismounted.

To insert or change the beam combiner proceeds as follows:

Please handle the beam combiner and the mounting frame, respectively, with reasonable care, as these components can easily be damaged.

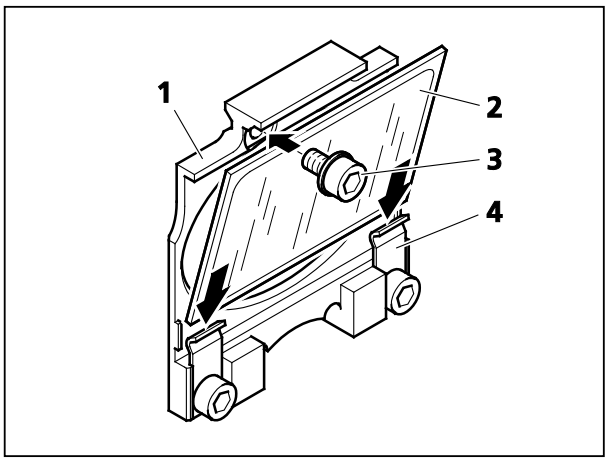


Fig. 5-5 Changing the beam combiner in the mounting frame

- Remove the mounting frame for the beam combiner (Fig. 5-5/**1**) carefully from the lamp module (see also Section 5.3).
- Loosen the screw (Fig. 5-5/**3**) and remove the beam combiner (Fig. 5-5/**2**).
- Carefully slide the new beam combiner underneath the spring-loaded frames (Fig. 5-5/**4**).
- Carefully re-tighten the screw (Fig. 5-5/**3**).

When mounted, the coated side of the beam combiner should point to the LED module with the shorter wavelength.

- Insert the mounting frame with the beam combiner again into the lamp module.

After completing the modification, assemble the lamp module again and mount it to the microscope.

Then, the lamp module can be used again (see Section 3).

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6 CONFIGURATION AND OPERATION IN MTB AND AXIOVISION

6.1 Configuration of LED modules, beam combiners and excitation filters

The LED modules inserted into the lamp module are recognized and registered automatically by the **Auto Configuration** function, provided that the control unit has been connected to the PC via the CAN bus of the (motorized) stand. If the connection has been established directly to the PC via USB, Colibri has to be selected manually in the MTB system and the LED modules have to be registered using the **Update Configuration** function (clicking on the **Colibri** icon with the right mouse key).

MTB 2004 can also be used to configure the beam combiners and to register any additional excitation filters possibly mounted in front of the LED modules.

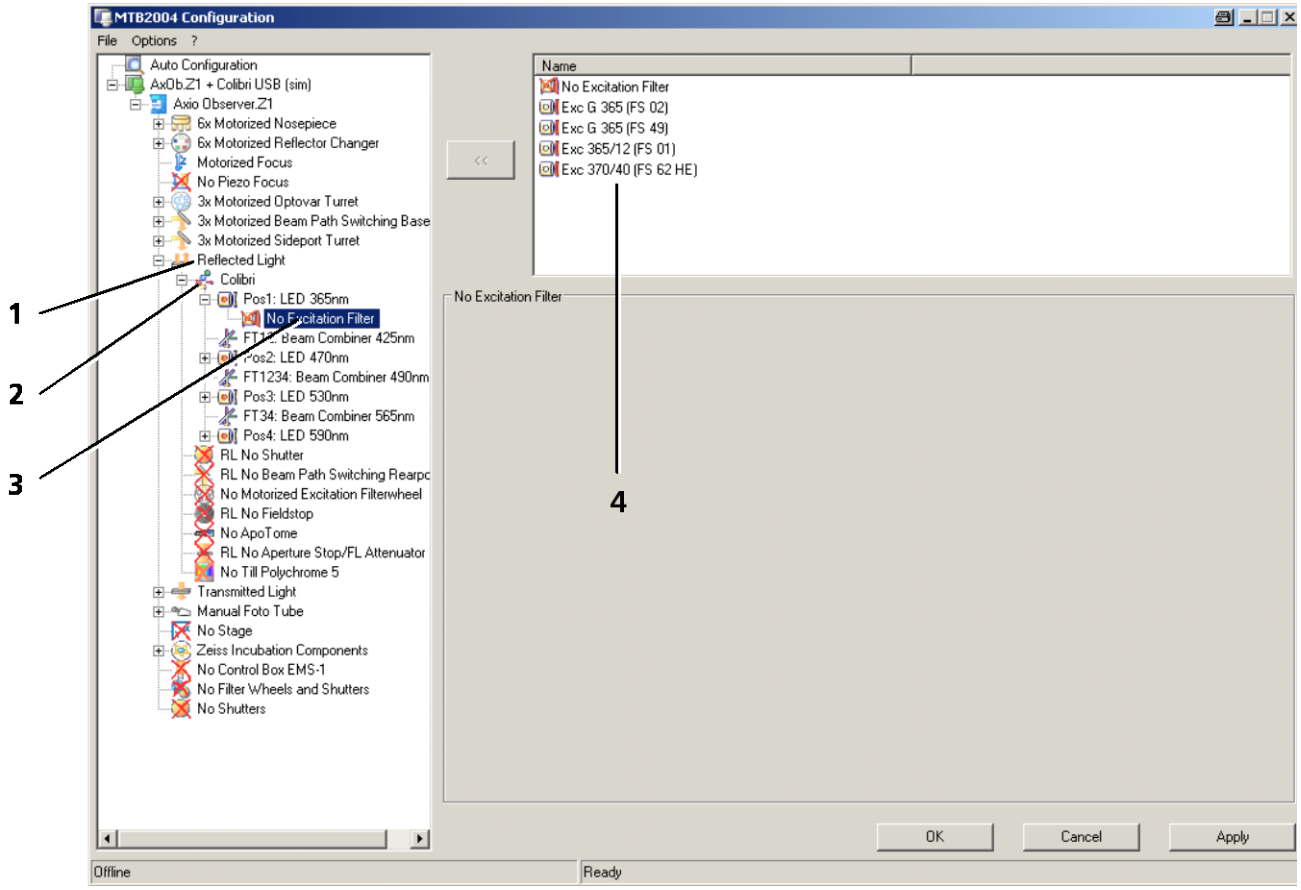


Fig. 6-1 Configuration via MTB2004

Like other fluorescence illuminators, the Colibri.2 illumination system is used in the reflected light path and appears, therefore, in the directory **Reflected Light** (Fig. 6-1/**1**).

- By clicking on the **Colibri** icon (Fig. 6-1/**2**) you get access to the subordinated selection list with various LED module and beam combiner positions.
- When clicking on the submenu item **(No) Excitation Filter** (Fig. 6-1/**3**), a selection list of excitation filters, which are suitable for being used in combination with the respective LED module, will appear in the right field (Fig. 6-1/**4**). The filter actually used can be selected by a double click.

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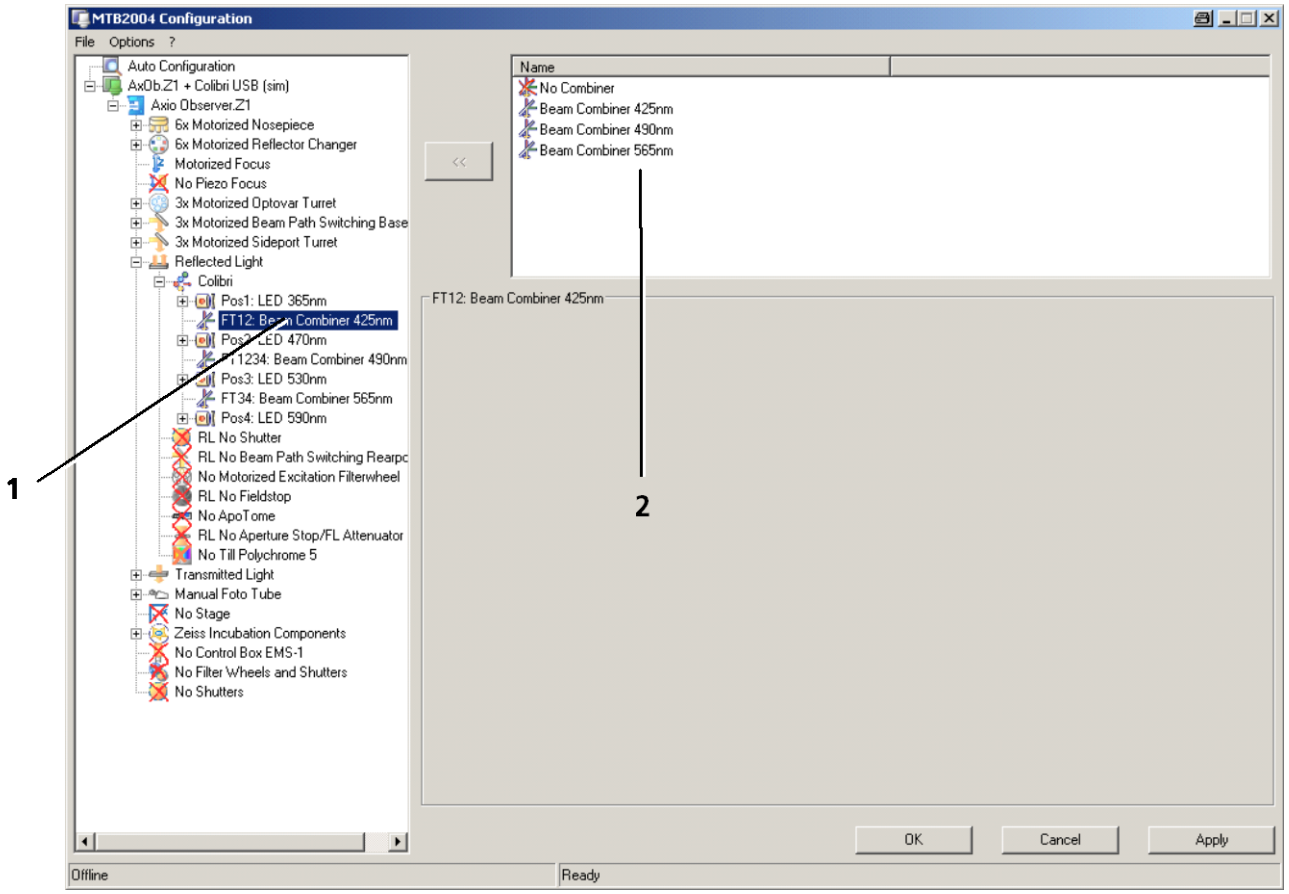


Fig. 6-2 Configuration via MTB2004

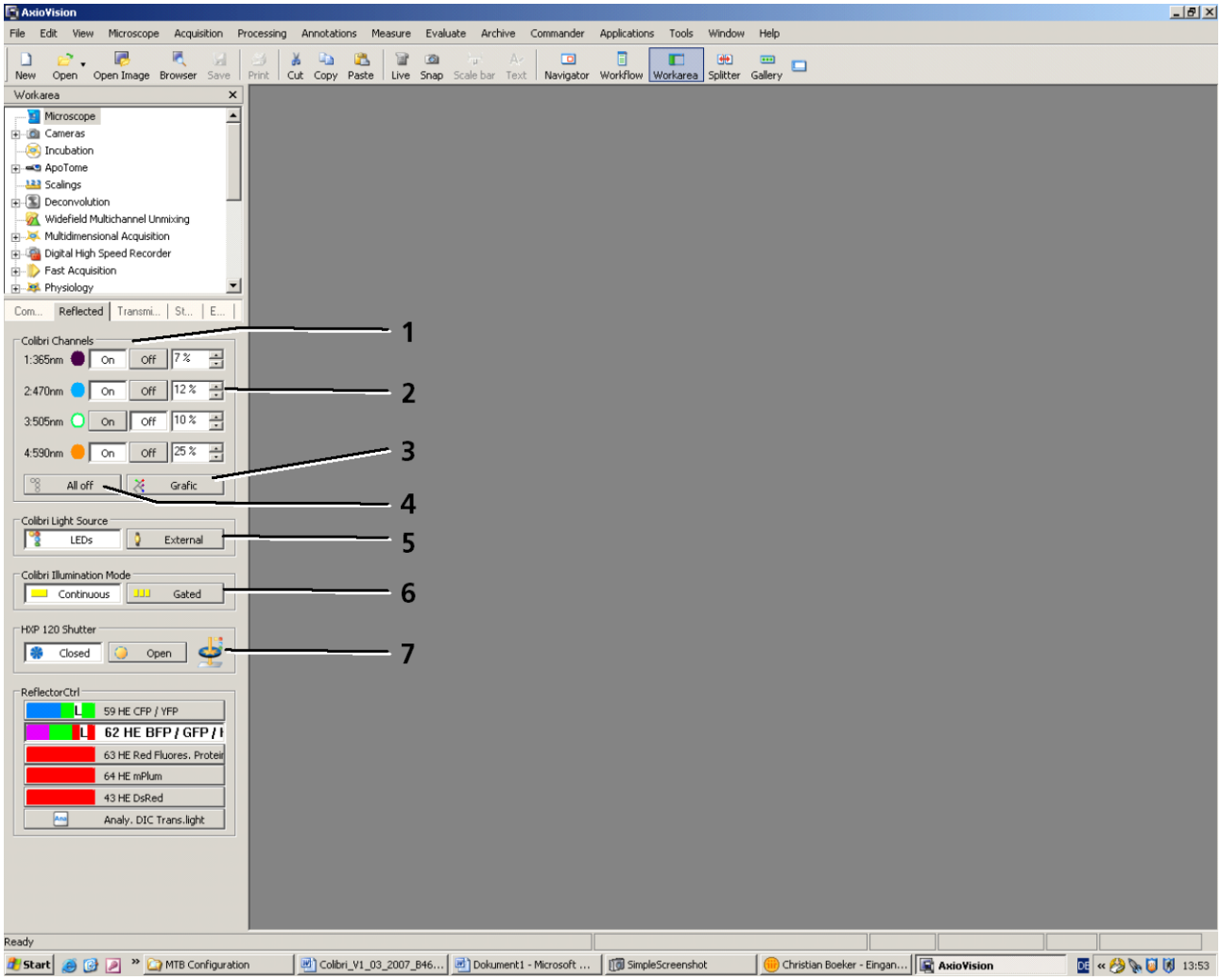
- The beam combiners (Fig. 6-2/**1**) are selected the same way in the list displayed (Fig. 6-2/**2**). In selecting the corresponding beam combiner make sure that its wavelength is between the wavelengths of the adjacent LED modules, for example beam combiner 425 nm between LED 365 nm on position 1 and LED 470 nm on position 2.

☞ After configuring the beam combiners and excitation filters do not select **Update Configuration** once more. Otherwise the entries would be overwritten by the default settings.

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6.2 Operation via the AxioVision Software

6.2.1 Microscope - Reflected Light Work area



1 LED module On/Off

2 Power in %

3 Overlaying the graphical representation

4 Switching off all LED modules

5 Selection between LED modules and external white light source

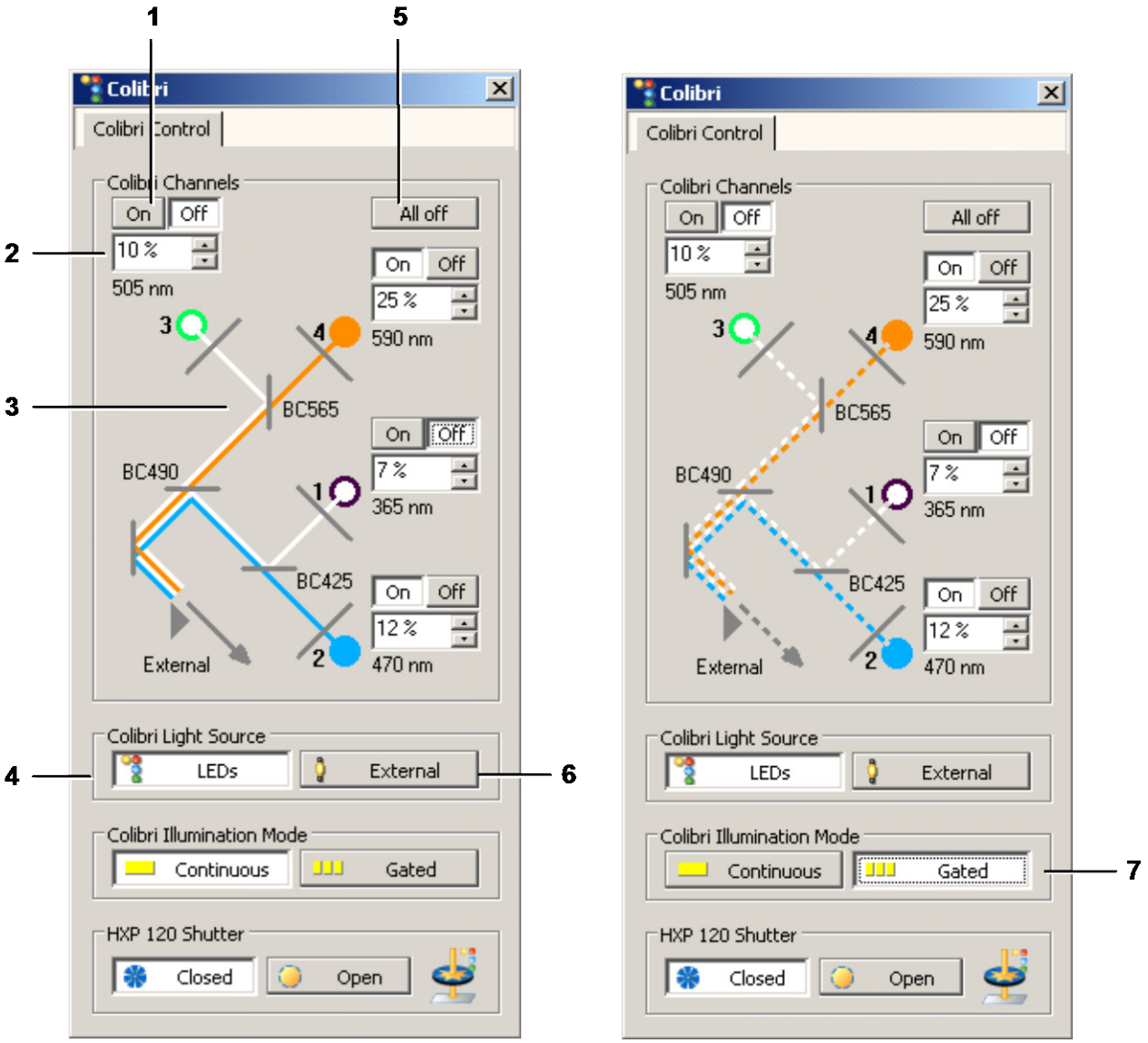
6 Selection between operating mode "continuous" and "gated" (light source waits for trigger signal)

7 Checking external shutter

Fig. 6-3 AxioVision Software: Microscope - Reflected Light Tab Work area

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6.2.2 Alternative operating menu with graphical representation



1 On/Off individually for each LED module

2 Setting of power in %

3 Schematic beam path

4 Selection between LED and external white light source

5 All LEDs On/Off

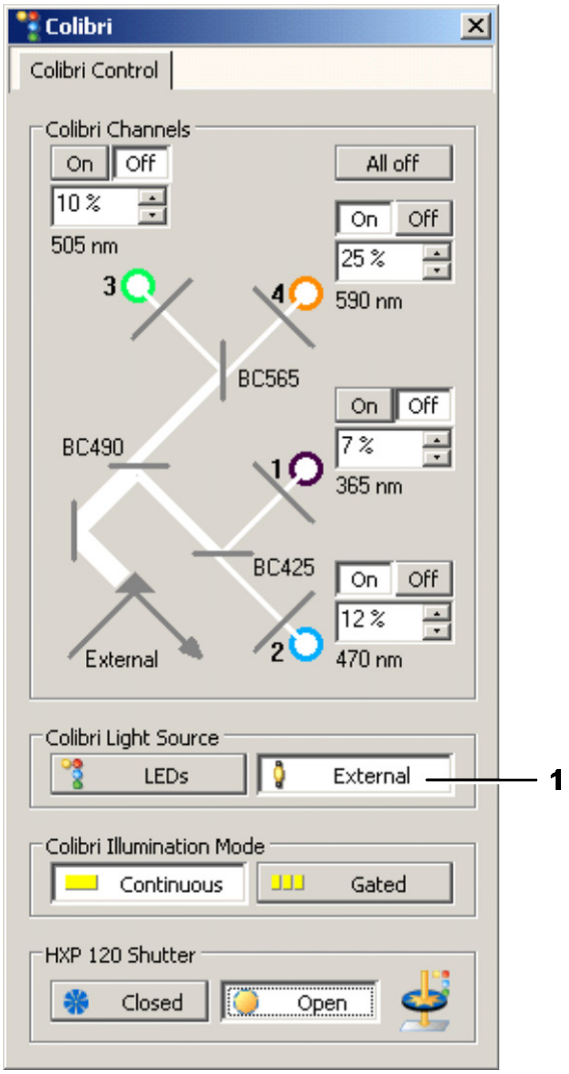
6 External white light source activated

7 Illumination mode "Gated" activated

Fig. 6-4 Operating the LED modules in the illumination mode "Continuous" or "Gated" via a separate operating menu

If the illumination mode **Gated** has been selected, the beam paths appear as dashed lines. The system is waiting for a trigger signal.

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1 External white light source activated

Fig. 6-5 Operating the external white light source via a separate operating menu

If the illumination is switched to the external white light source by clicking on **External**, the LED modules will be switched off automatically. The switching prism symbolized in the graphics changes its position to external. When switching back to **LEDs**, the shutter of the external white light source HXP 120 V will be closed automatically and the LED modules will be reset to the original operating state.

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7 CONFIGURATION EXAMPLES OF THE LAMP MODULE

Examples of configuration when equipping the lamp module with 4, 3, or 2 LED modules

The LED modules and beam combiners printed in **bold face** refer to the corresponding example configuration displays (see below).

The LED modules in one box can only be used alternatively.

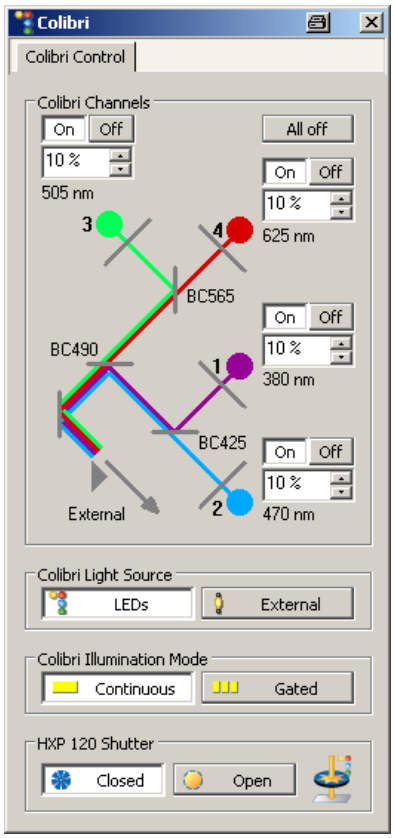
Example configuration	LED Pos. 1	BC 12	LED Pos. 2	BC 1234	LED Pos. 3	BC 34	LED Pos. 4
4 LED modules provided							
1	365 nm **380 nm** 400 nm	**BC 425**	455 nm **470 nm**	**BC 490**	**505 nm** 530 nm	**BC 565**	590 nm 615 nm **625 nm**
3 LED modules provided							
2	**365 nm** 380 nm 400 nm	**BC 425**	**455 nm** 470 nm	**BC 490**	empty	empty	**505 nm** 530 nm
3	365 nm 380 nm **400 nm**	**BC 425**	455 nm **470 nm**	**BC 490** BC 565		empty	590 nm **615 nm** 625 nm
4	empty	empty	**365 nm** 380 nm 400 nm	BC 425 **BC 490**	505 nm **530 nm**	**BC 565**	590 nm 615 nm **625 nm**
5	empty	empty	**455 nm** 470 nm	**BC 490**	505 nm **530 nm**	**BC 565**	**590 nm** 615 nm 625 nm

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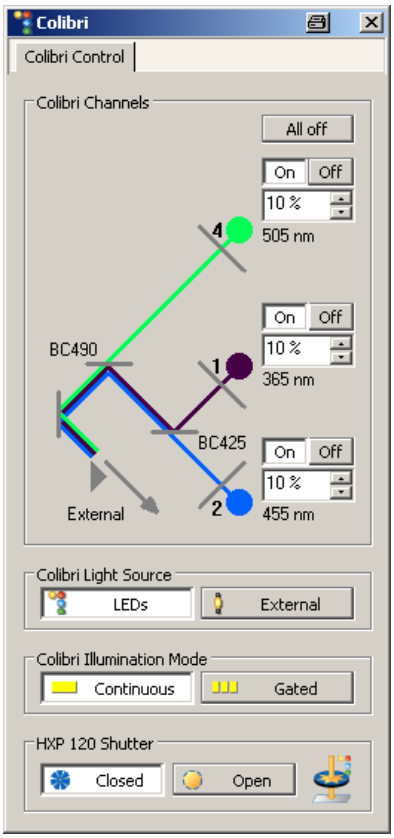
Example configuration	LED Pos. 1	BC 12	LED Pos. 2	BC 1234	LED Pos. 3	BC 34	LED Pos. 4
2 LED modules provided							
6	empty	empty	empty	empty	365 nm **380 nm** 400 nm	**BC 425**	455 nm **470 nm** 505 nm 530 nm 590 nm 615 nm 625 nm
6a	empty	empty	365 nm **380 nm** 400 nm	**BC 425**	empty	empty	455 nm **470 nm** 505 nm 530 nm 590 nm 615 nm 625 nm
7	empty	empty	empty	empty	365 nm 380 nm 400 nm **455 nm** 470 nm	**BC 490**	505 nm 530 nm **590 nm** 615 nm 625 nm
8	empty	empty	empty	empty	365 nm 380 nm **400 nm** 455 nm 470 nm 505 nm 530 nm	**BC 565**	590 nm **615 nm** 625 nm

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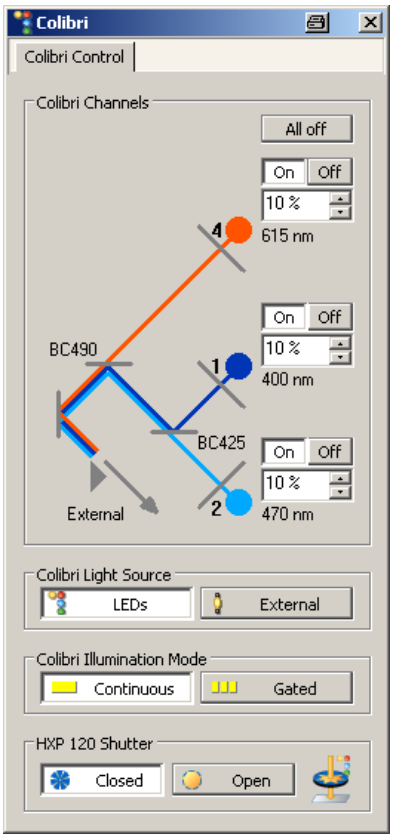
Example 1:



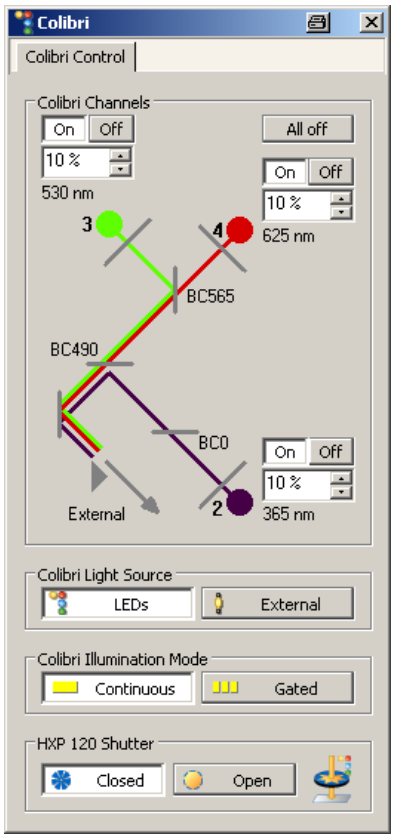
Example 2:



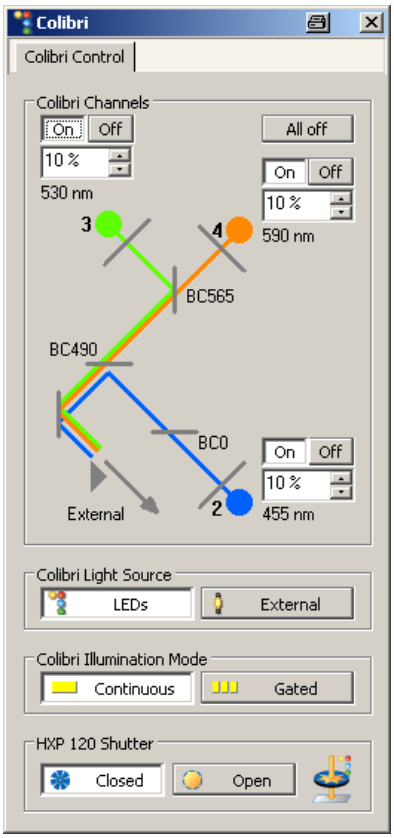
Example 3:



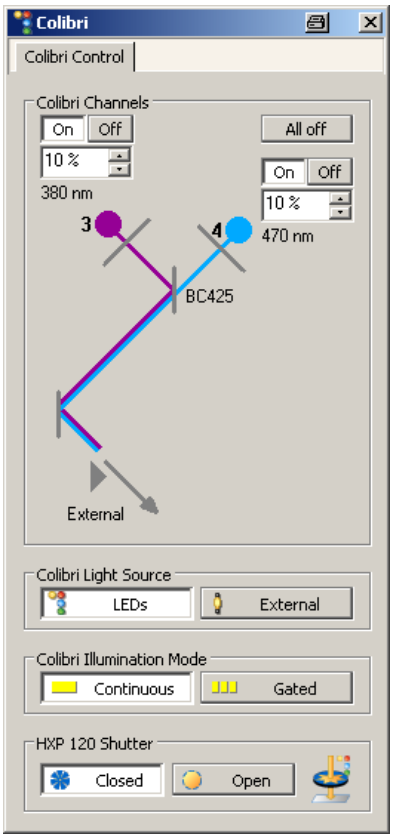
Example 4:



Example 5:

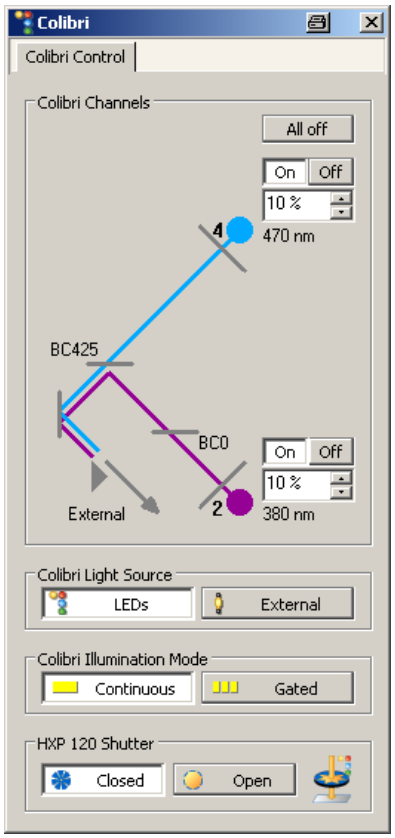


Example 6:

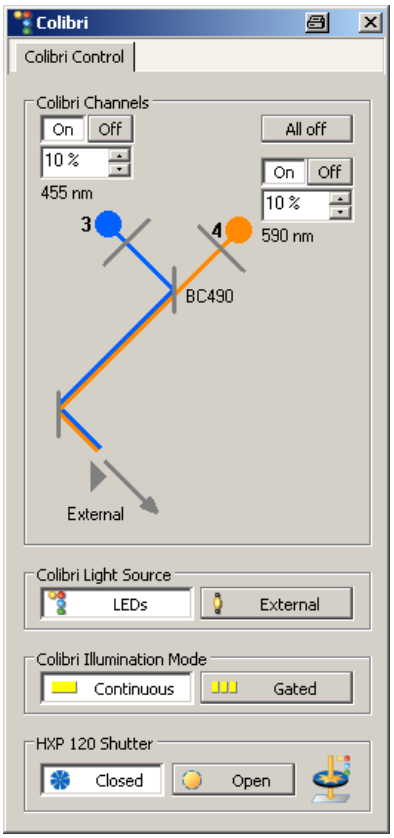


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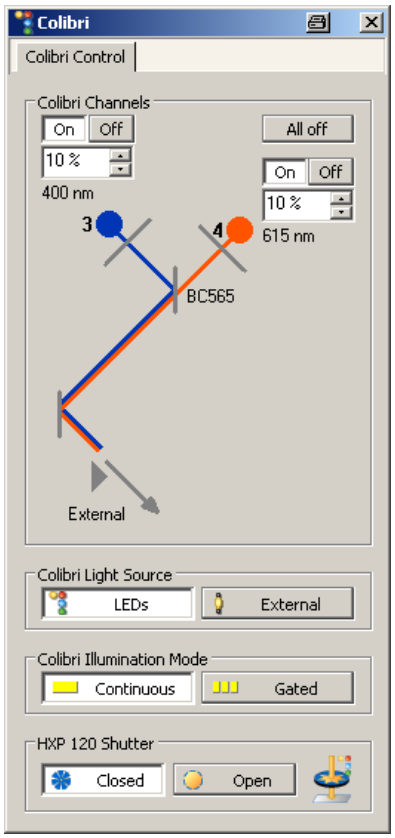
Example 6a:



Example 7:



Example 8:



LED modules

Part number	Designation	Main wavelength	Peak wavelength	Half-width
423052-9011-000	LED 365 nm	360 – 370 nm	360 – 370 nm	8 nm
423052-9022-000	LED 350 nm	375 – 385 nm	375 – 385 nm	15 nm
423052-9031-000	LED 400 nm	390 – 410 nm	390 – 410 nm	15 nm
423052-9141-000	LED 420 nm	410 – 420 nm	410 – 420 nm	15 nm
423052-9131-000	LED 445 nm	450 nm	440 – 460 nm	24 nm
423052-9042-000	LED 455 nm	455 – 460 nm	450 – 455 nm	25 nm
423052-9052-000	LED 470 nm	470 – 475 nm	465 – 470 nm	30 nm
423052-9061-000	LED 505 nm	505 – 510 nm	500 – 505 nm	40 nm
423052-9072-000	LED 530 nm	530 – 535 nm	525 – 530 nm	45 nm
423052-9082-000	LED 590 nm	585 – 590 nm	590 – 595 nm	20 nm
423052-9091-000	LED 615 nm	615 – 620 nm	620 – 625 nm	20 nm
423052-9101-000	LED 625 nm	625 – 630 nm	630 – 635 nm	20 nm
423052-9121-000	LED 540 – 580 nm	–	–	–

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Especially recommended filter sets for multi-channel fluorescence applications without switching the reflector turret

Part number	Designation	Examples of dyes	Components
489059-9901-000	Filter set 59 HE CFP + YFP shift free DMR 25	CFP YFP	2 excitation filters (single band), 1 beam splitter (dual band), 1 emission filter (dual band)
489060-9901-000	Filter set 60 HE CFP + YFP + HcRed shift free DMR 25	CFP YFP HcRed	3 excitation filters (single band), 1 beam splitter (triple band), 1 emission filter (triple band)
489061-9901-000	Filter set 61 HE shift free DMR 25	eGFP HcRed	2 excitation filters (single band), 1 beam splitter (dual band), 1 emission filter (dual band)
489062-9901-000	Filter set 62 HE shift free DMR 25	BFP GFP HcRed	3 excitation filters (single band), 1 beam splitter (triple band), 1 emission filter (triple band)

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8 CARE, CHANGE OF FUSES, AND SERVICE

8.1 Care

Care of the device is limited to the following operations:

- Cover the device with the dust cover (microscope) after every use.
- Do not set up the device in a damp room.
- Remove dust and loose dirt from visible optical surfaces using a brush, a blowing brush, a cotton swab, optics cleaning paper, or a cotton cloth.
- Remove water-soluble dirt (coffee, cola, etc.) after breathing on it, using a dust-free cotton cloth or a moistened cloth. You can add a mild detergent to the water.
- Remove stubborn oily or greasy dirt (immersion oils, fingerprints) using a cotton swab or a dust-free cotton cloth dipped in the optics cleaning mixture L.
  This cleaning mixture is produced of 90 % by volume of gasoline and 10 % by volume of isopropanol (IPA). The individual components are also known under the following synonyms:
  Gasoline: Surgical spirit, petroleum ether
  Isopropanol: Isopropyl alcohol, dimethyl carbinol, 2-hydroxypropane

To clean the optical surface moves the swab or cloth in circles from the center to the edge of the optical surface. Slight pressure should be used on the optics during cleaning.

The control unit must be cleaned using a slightly moistened, not dripping cloth. Make sure that no humidity enters the device.

When using the device in warm and humid climatic zones, pay attention to the following instructions:

- Store the device in bright, dry and well-ventilated rooms with a humidity of less than 65 %; store particularly sensitive optical components and accessories, such as objectives and eyepieces, in a dry cabinet.
- When storing the device in closed cases for a longer period of time, the growth of fungus can largely be avoided by putting in cloths soaked in fungicide.



The risk of fungus growth on opto-mechanical instruments invariably exists in the following conditions:

- Relative humidity in excess of 75% and temperatures between +15 °C and +35 °C for more than three days.
- Installation in dark rooms without air ventilation.
- Dust deposits and fingerprints on optical surfaces.

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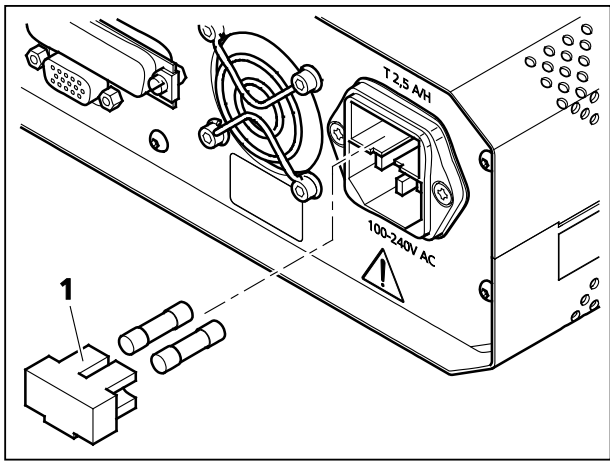


Fig. 8-1 **Changing the fuses of the control unit**

8.2 Changing the fuses of the control unit

The fuse holder is located at the rear of the control unit.

In case of a fuse failure, at first you should find the reason. If the failure is due to a technical fault, it has to be properly taken care of.

Before changing the fuses, disconnect in any case the power plug from the power supply.

- Disconnect the power plug.
- Pull the fuse holder (Fig. 8-1/**1**) out of the fuse compartment.
- Replace the defective fuse **T 2,5 A/H**.
- Push the fuse holder back into the fuse compartment until it locks into place.
- Connect the power plug again.

8.3 Service

Any intervention concerning optical components or moving elements inside the device, as well as any work on the power supply may only be performed by qualified service technicians or specially **authorized** personnel.

When service is required, please contact your competent local representative or

Carl Zeiss Microscopy GmbH
Carl-Zeiss-Promenade 10
07745 Jena, Germany

microscopy@zeiss.com
www.zeiss.com/microscopy

Carl Zeiss Microscopy GmbH
Königsallee 9-21
37081 Göttingen, Germany

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9 ANNEX

9.1 Property rights

Devices, parts of devices or any procedures described in this manual are protected by the following patents:

US 6154282 A1 Semiconductor based excitation illuminator for fluorescence and phosphorescence microscopy.

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