

MicroLED fluorescence illuminator

For Use with Magnus MLXi / ICON Microscopes

This instruction manual is for the Magnus MicroLED fluorescence illuminator for use with Magnus MLXi or ICON Microscope. In order to obtain best optical performances and ensure safety please familiarize with the contents of this manual before operating the system

INSTRUCTION MANUAL

The specifications are subject to change.

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WARNING If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. MicroLED fluorescence illuminator and its original accessories are intended to be used only for the purposes described in this manual. The manufacturer assumes no responsibility for any other use different from what described in this manual.

PARTNERSHIP:

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1. INTRODUCTION:

WORLD CLASS MANUFACTURING WITH WORLD CLASS PRODUCTION

INFRASTRUCTURE with a well trained and motivated work force - MAGNUS ensures it has one. Guided by a management with vision, the Magnus team focuses on adopting the best production processes and practices from all over the world to manufacture flawless products. To ensure this its core engineering team has been specially trained in Japan, Italy & Germany by experts from leading optical engineering companies in the world.

MAGNUS HAS AN UNCOMPROMISING COMMITMENT TOWARDS QUALITY

Magnus microscopes are today recognized for their precision engineering and high-performance optics. Influenced by a Japanese legacy, Magnus has an uncompromising commitment towards quality. A group of highly qualified and experienced engineering personnel work closely with a highly motivated workforce in providing products and services of international quality.

MAGNUS – LED MICROSCOPES WITH WORLD CLASS OPTICS

Magnus brings you convenience & performance in one single exciting package. Equipped with the Long life LED Light source – the light of the future (available with or without battery back-up)

MAGNUS – FRAEN PARTNERSHIP

MAGNUS & FRAEN Corporation, ITALY bring you an integrated optical solution for Fluorescence Microscopy consisting of a unique proprietary illumination with high power solid state (LED) Sources to replace the Mercury & Xenon lamps found in traditional Fluorescence Microscopes. Light source life time: typically 30000 hrs. thus allowing many years of operation with cost savings.

MAGNUS RANGE OF PRODUCTS:

- Biological Microscopes (For Laboratory & Research Applications)
- Infinity Plan Microscopes (For Research Applications)
- LED Microscopes (Long Life High Brightness LED light Source – The Light of the Future)
- Freedom (Long life LED with battery back-ups for Field Applications)
- MicroLED Fluorescence Attachment (For Auto-Immune & TB Tests Applications)
- Stereo Microscopes (For Medical & Hygienic Applications, Inspections of Gems, Electronic Components & Precision Machinery Components)
- Inverted Microscopes (For Tissue Culture Applications)
- Micro Image Projection System (For Educational Applications)
- Microscope Adapters for Digital Imaging (for Educational & Research Applications)
- Magnus-Pro Image Analysis Software - For Arranging and Measuring Captured Images, Creating Databases and Preparing Reports (for Educational & Research Applications)

2. INSTRUMENT DESCRIPTIONS:

2.1 Purpose and application

MicroLED Fluorescence Light Illuminator is intended to provide high standard levels of illumination by using solid-state sources (LED) to increase performance and light source lifetime reduce initial costs and operating costs, reduce maintenance and heat production as compared with conventional high pressure Mercury or Xenon Arc-Lamps.

2.2 General Description

MicroLED fluorescence light illuminator utilize an interchangeable solid-state light source (LED), driver electronics and excitation filter to produce a narrow band of light (single color) for exciting fluorescing dyes on assays. The kit is designed to attach to a standard bright field microscope and does not change the characteristics of the microscope in any way. The fluorescence light source is used in transmission mode rather than epi-mode. Bright field microscopy is not affected since the halogen white light function major remains intact, which means that transmitted light observation is possible without changes in the optical configuration.

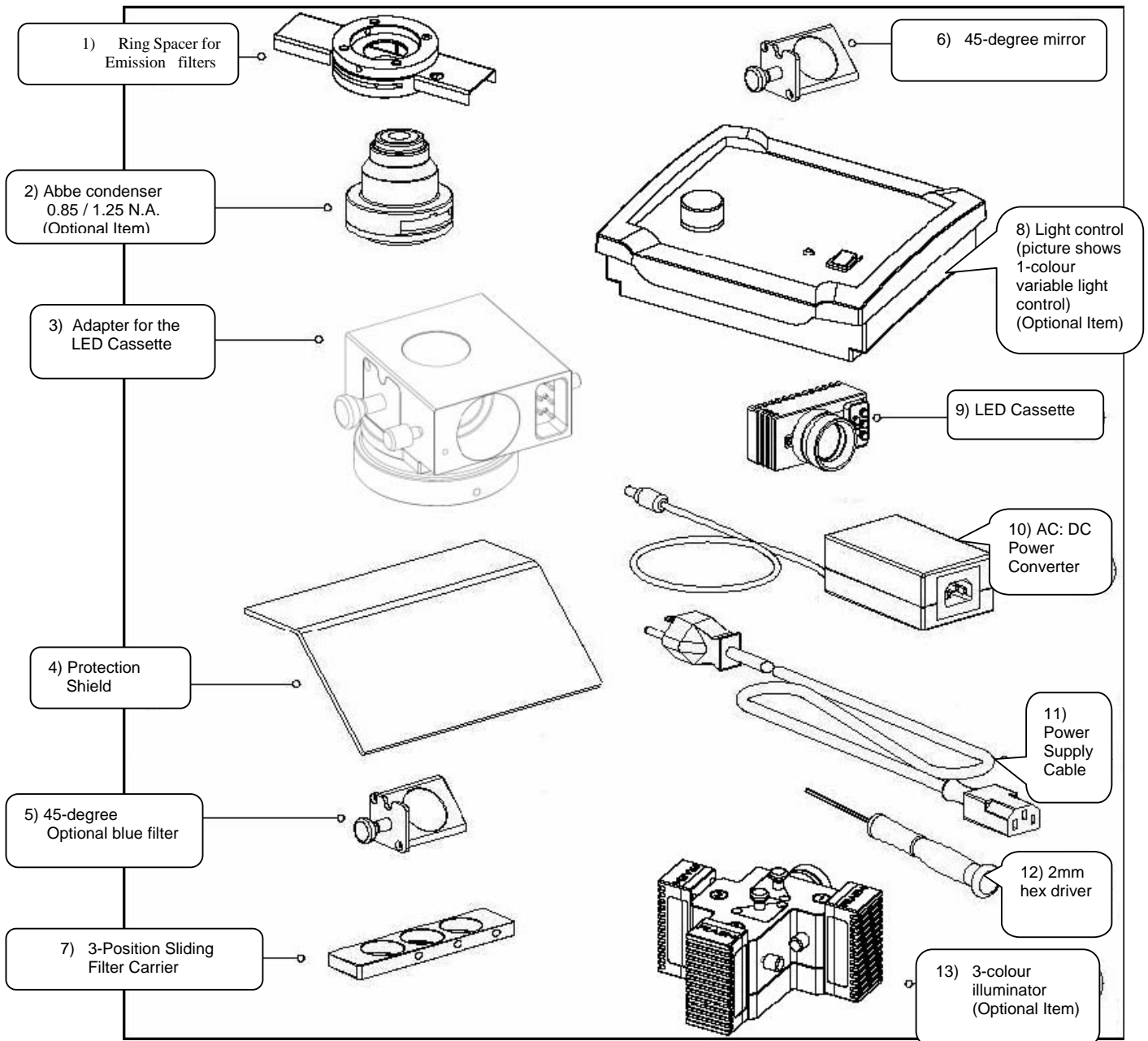
The LED modules are light sources with an extremely efficient emission spectrum that essentially produce light energy only in the desired bandwidth. Magnus fluorescence light cassettes are available in colors across the visible light spectrum, 450nm (Royal Blue), 480nm (Blue) and 535nm (Green),

| FRAEN LED cassettes | | |
|---------------------|--|--------|
| ROYAL BLUE | | 450 nm |
| BLUE | | 480 nm |
| GREEN | | 535 nm |

2.3 Parts list

| Component | Name | Description and Comments |
|-----------|---|---|
| 1 | Ring spacer for emission filters | Accepts the 3-position sliding filter carrier. In 1-colour and 3-colour variable light systems. |
| 2 | Abbe condenser 0.85/1.25 N.A. (Optional Item) | The Abbe condenser (0.85/1.25 N.A.) is optionally available for the Magnus MicroLED fluorescence light module contains special optics for fluorescent light sources, but looks similar to the Abbe condenser (1.25 N.A.) provided with the MLXi or ICON microscope. |
| 3 | Adapter for the LED cassette | Fits to the microscope stand, accepts LED cassette. |
| 4 | Protection shield | For your safety always install the protection shield. |
| 5 | 45-degree optional blue filter. | As an option, for color correction of halogen light when using the microscope in transmitted white light. In 45-degree holder. Fits into adapter slot. |
| 6 | 3-position sliding filter carrier | Holds one emission filter according to the LED cassette in use. Free positions have a blank installed. Each filter is tilted at 4 degrees. Avoid touching the filters. |
| 7 | 45-degree mirror | Reflects light from LED cassette into Abbe condenser. |
| 8 | Light control (picture shows 1-colour variable light control) (Optional Item) | Power supply for LED cassette. 7.5VDC input, variable DC output. 3-colours variable light control and 1-colour non-variable light control not displayed. |
| 9 | LED cassette | Light source for fluorescence excitation. |
| 10 | AC:DC power converter | Provides power from wall outlet to the electronic driver. 100-240VAC 50/60Hz input, 7.5V DC output. |
| 11 | Power supply cable | For AC:DC power converter |
| 12 | 2mm hex driver | Use this tool to loosen/tighten the set screws of the ring spacer. |
| 13 | 3-colour illuminator (Optional Item) | Fits to the clamp-on adaptor (3) and allows using up to 3 LED cassettes. With dichroic beam splitters. |

2.4 Nomenclature



2.5 Technical data

(1) Transport conditions

Temperature range (with original packaging).....-40°C to + 70°C (-40°F to 158°F)

(2) Storage conditions

Ambient temperature range 5°C to +40 °C (41°F to 104 °F)

(3) Operating environment

Operating temperature.....5°C to +40 °C (41°F to 104°F)

Maximum relative humidity75% at 35°C

Operating air pressure 800 hPa to 1060 hPa

Altitudes.....max. 2000 meters (6.561, 7 feet)

Pollution degree.....2 (according to IEC 60664)

UseIndoor use

(4) AC: DC power converter

AC: DC power converter... 100-240VAC 50/60Hz input, 7.5V DC output
 temperature.... 5°C to +40 °C (41°F to 104°F), according to UL 60950-1
 According to IEC 53, length < 2 meters (78, 7")
 18 AWG

Operating
 Power cord.....
 Wire gauge ...

(5) 1-colour variable light control

Input.....7.5 V DC, 2 A, 15 W Output.....7 V DC, 1, 4 A, 10 W

(6) 3-colours variable light control

Input.....7.5 V DC, 2 A, 15 W Output....7 V DC, 1, 4 A, 10 W

(7) Non-variable light control

Input.....7.5 V DC, 2 A, 15 W Output....7 V DC, 1 A, 10 W

3 Set-ups

3.1 Magnus MLXi / ICON microscopes

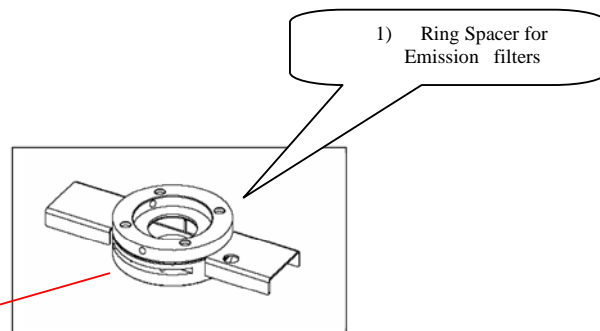
INDICATION

The following instructions described in this manual assume that the microscope is configured with a binocular tube (with or without TV port), eyepieces, objectives and Abbe condenser installed. If you have received a new unassembled microscope, you should first assemble it and then retrofit the MicroLED fluorescence illuminator according to the following instructions.

3.2 MicroLED Assembly on MLXi / ICON microscopes

Removing the microscope tube

Loosen the knurled screw on the right side of the microscope stand and take off the microscope tube.

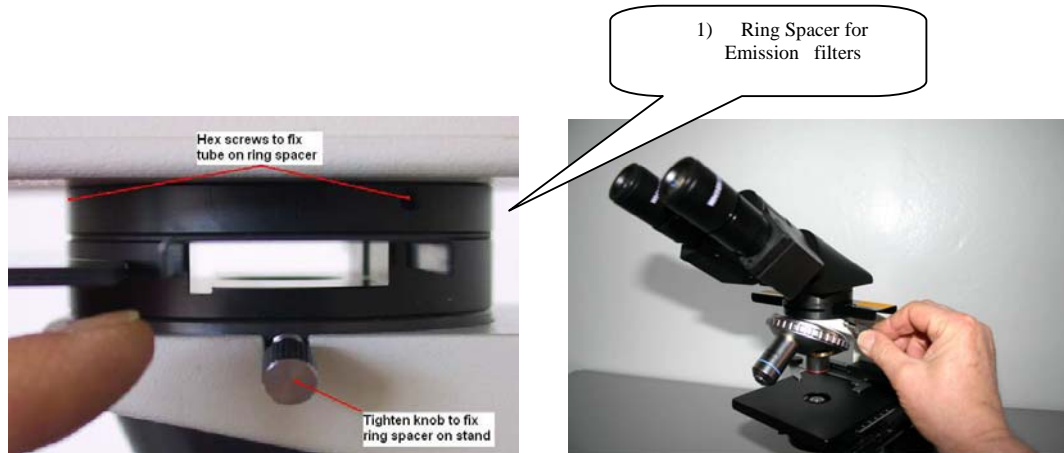


Attaching the ring spacer

The ring spacer is inserted between tube and microscope stand: it is needed to install the protection shield and the filter carrier.

Place the ring spacer on the stand and tighten the knurled knob.

The tube is then attached to the ring spacer using three hex screws. Use the included hex driver. Please check that the groove on the ring spacer is facing toward the user: if needed you can adjust the position by loosening slightly the knob, rotating the tube and tightening the knob again.



Adjusting the position of the microscope tube

Please check that the groove on the ring spacer is facing toward the user: if needed you can adjust the position by loosening slightly the knob, rotating the tube and tightening the knob again.

WARNING

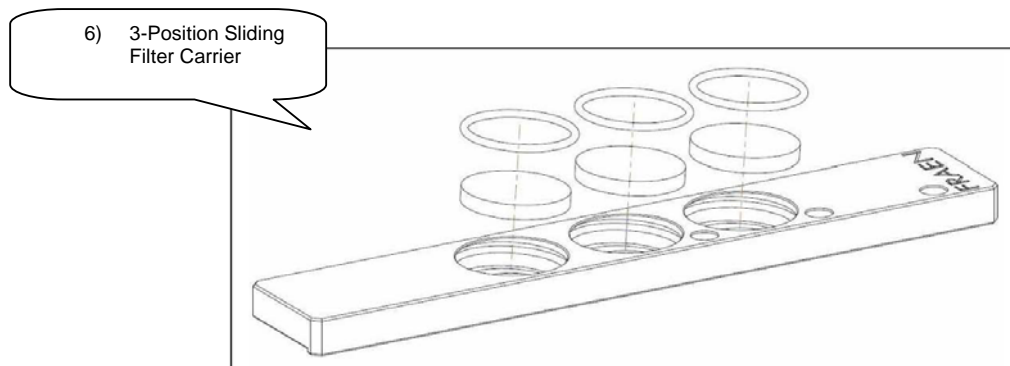
Install the protection shield on the ring spacer when MicroLED fluorescence illuminator is switched on. Avoid exposure of eyes and skin to unshielded light.



Do not look at exposed light source in operation. Eye injury could result. Use protection shield.

Install emission filters into filter carrier

The filter carrier is initially fitted with blank placeholders that are held in place by O-rings. Remove the blank from the desired position and install the emission filter in the space.

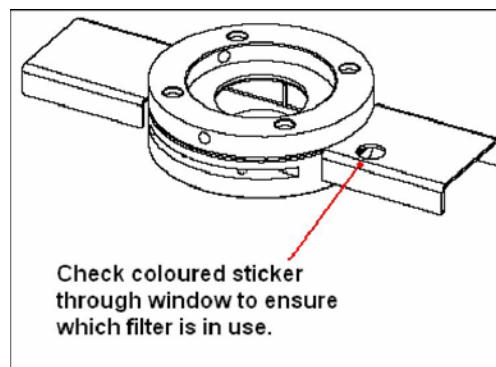


INDICATION

Proper orientation of the filter is necessary in order to minimize auto fluorescence and maximize performance. There is an arrow located on the edge of each filter in order to aid orientation. Emission filters should be placed with the arrow pointing toward the specimen. The filter carrier is keyed to the filter slot in the ring spacer by a ridge on the bottom front edge of the filter carrier.

ATTENTION

The filter holder angles the filter at a 4° angle. Do not attempt to force fit the filters flat into the carrier.



The ring spacer has an additional dust cover to protect the filters in the slider. A colored sticker matching the excitation light may be applied on the slider and allows recognizing which filter is currently inserted in light path. Stickers are delivered with the kit.

Slide the filter carrier into the slot in the ring spacer.

Detents on the filter carrier ensure the filters in the proper position. Please see later section on care and orientation of filters.

WARNING It is critical to install the correct emission filter before operating the microscope. Staring into the microscope eyepieces without using the correct emission filter can cause eye damage.

Replacing the standard condenser with optional condenser (2):

Rack the condenser to its lowest position using the condenser carrier drive knob and then raise the microscope stage fully, using the coarse focus adjustment knob.

Loosen the screw on the condenser, the condenser is easily replaced.



Loosen the screw on the condenser the condenser is easily replaced

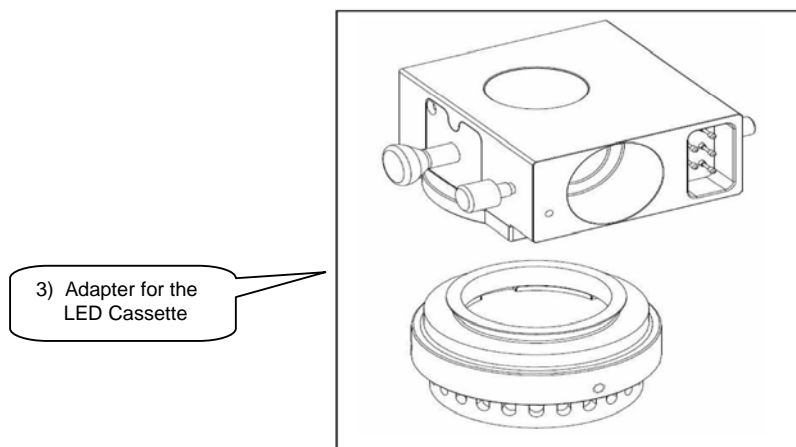
Install the optional Abbe condenser (N.A 0.85/1.25)

Place the Magnus condenser in the carrier ring and tighten the screw again.
Rack the condenser up to its maximum height



Installing the LED adaptor

Raise the microscope stage and the condenser to their maximum height to fit the LED adaptor onto the microscope. The LED adaptor is mounted on a holder, which has to be fitted on the field diaphragm first.



First place the holder on the field diaphragm.



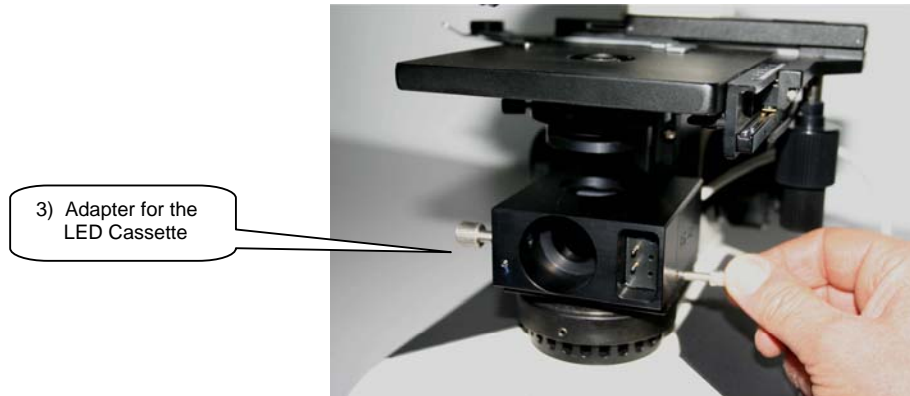
The holder is attached to the field diaphragm by fixing the three hex screws. Use the included hex driver.

Slide the adaptor over the holder (cassette opening and pins to the front). The adaptor is designed to fit on top of the holder and should fit exactly.



ATTENTION

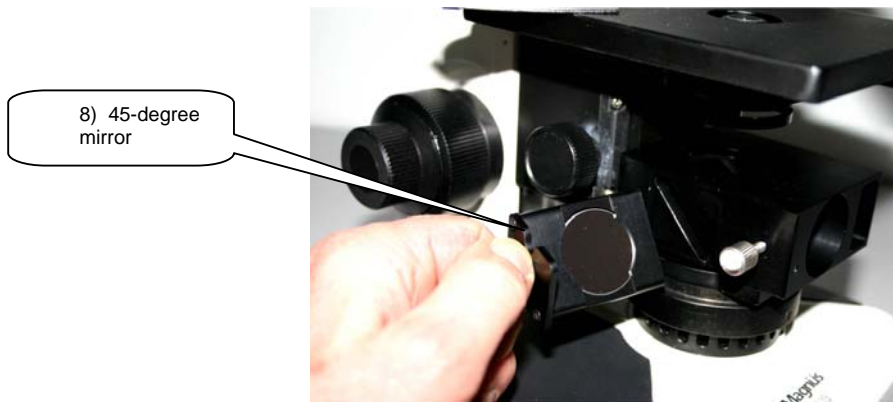
The adaptor should fit easily. If there is a problem, do not force-fit. Move it around a bit until it fits exactly over the light housing.



Finally fix the LED adaptor by tightening the knob on the right side.

Install Mirror

A mirror is provided to direct the light from the LED adaptor to the condenser. Slide the mirror into the slot on the left-hand side of the adaptor. The mirror has a key on it and will fit in only one position: facing the front of the microscope at a 45° angle. A color balancing blue filter can be supplied as an option. It replaces the mirror when bright field operation is required (bright field illumination is supplied by the standard microscope lamp).



INDICATION

During first time installation please remove protective film from mirror before insertion.

Excitation Cassette: installation and use

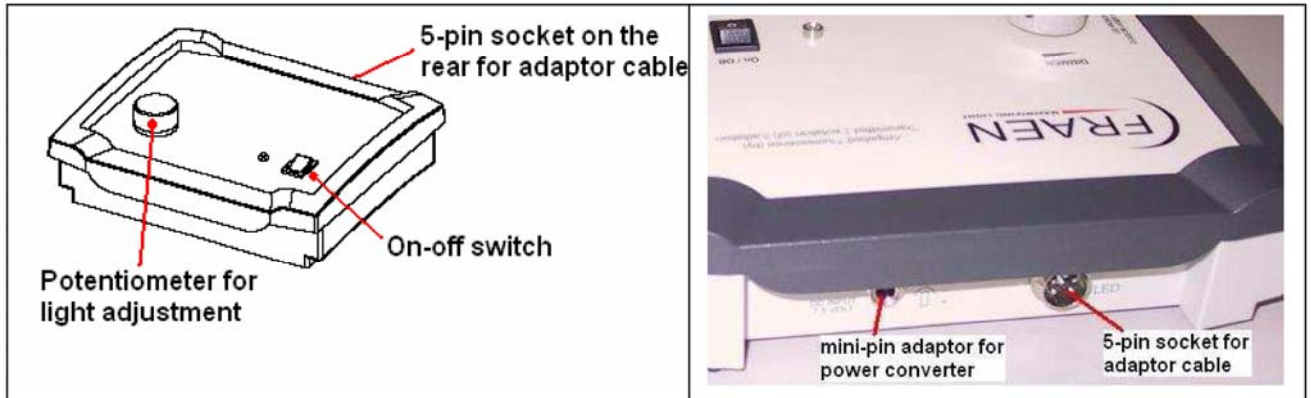
The MicroLED illuminator is available in three different configurations, depending on the light control unit (driver) and number of excitation colors used. The single fluorescence system here described comes with a 1-colour variable light control. It allows using LED cassettes of any color. For a complete description of the different configurations please refer to section 3.5, Variable and non-variable control units. Select a desired LED cassette according to the fluorochrome you would like to excite and remove the protective cap. Insert desired excitation cassette into round space at front of LED adaptor. Pin side goes on right side to contact pins on LED adaptor.

Push cassette all the way in against the spring-loaded contact pins. Tighten knurled knob on left side of LED adaptor to hold cassette in place. When cassette is not in use, cover filter with supplied protective cap.

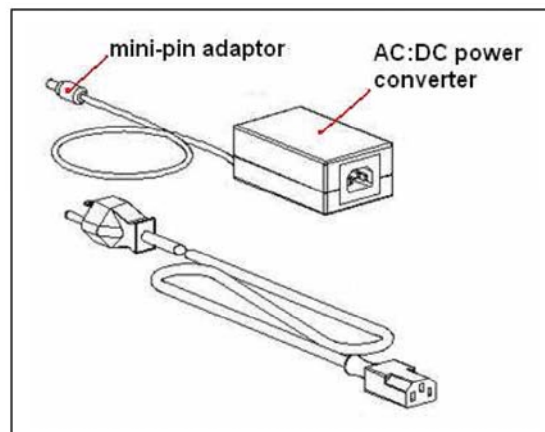
9) LED Cassette



Single fluorescence system with 1-colour variable light control (Optional Item)



The single fluorescence system comes with a 1-colour variable light control. It allows using LED cassettes of any color. The adaptor power cable fits onto the 5-pin socket labeled “LED” at the rear of the control unit. Plug the mini-pin adaptor of the AC-DC power converter into the socket labeled “DC Input” at the rear of the control unit.



Attach standard power cord to power supply and plug into wall outlet.



MLXi microscope with MicroLED fluorescence illuminator installed.

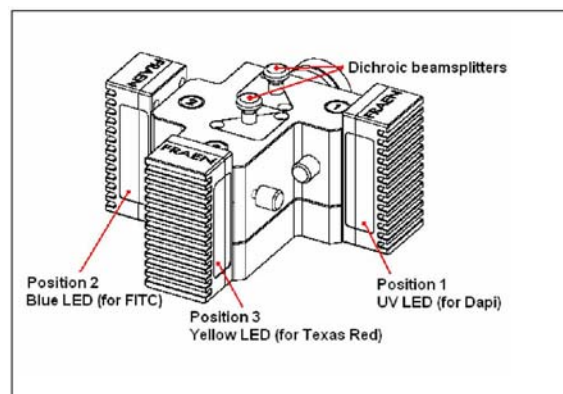
3.3 Multiple fluorescence illuminator (Optional Item)

The multiple fluorescence system comes with a 3-colour illuminator that fits directly into the clamp-on adaptor. It allows using up to three LED cassettes. The light emitted by each cassette is directed by dichroic beam splitters to the 45° mirror of the clamp-on adaptor.

Please make sure to install LED cassettes into proper position: lowest wavelength in position 1, highest in position 3. Wavelengths are printed on cassette labels. Do not change position of the dichroic beam splitters: otherwise their spectral reflection will not match the LED cassettes anymore.



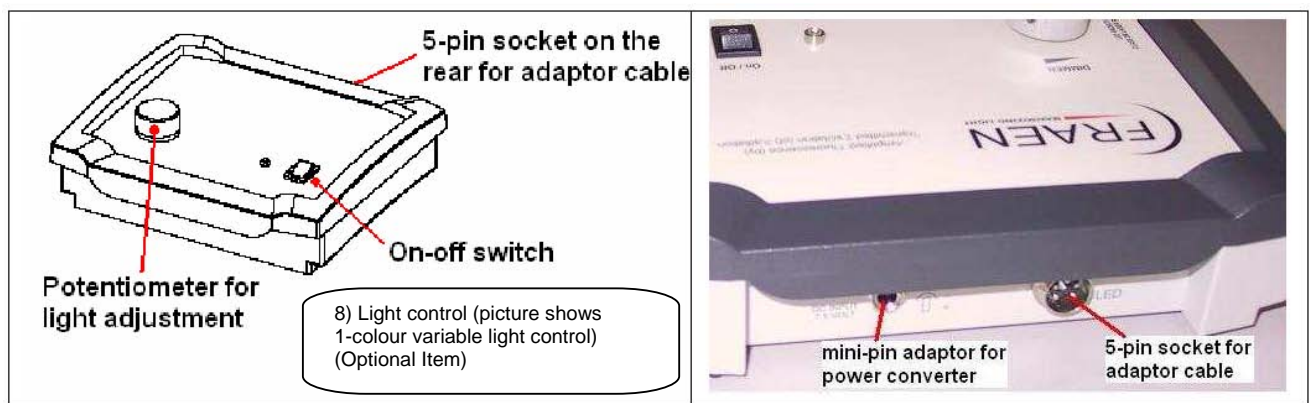
Example Dapi-Fitc-Texas Red:



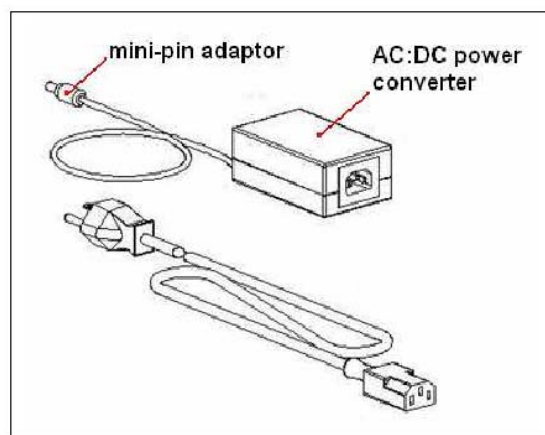
3.4 Variable and non-variable light control units

The MicroLED illuminator is available in three different configurations, depending on the light control device (driver) and number of excitation colors used.

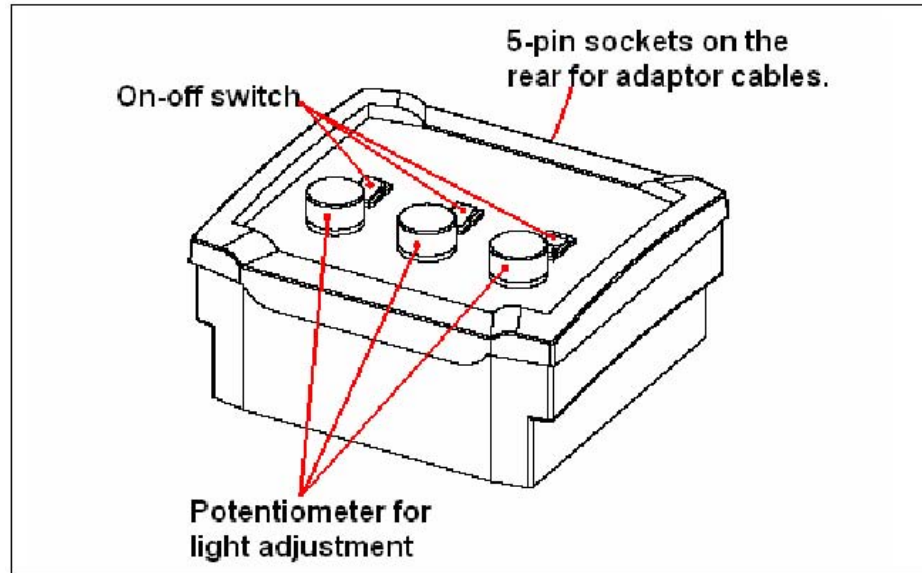
Single fluorescence system with 1-colour variable light control (Optional Item)



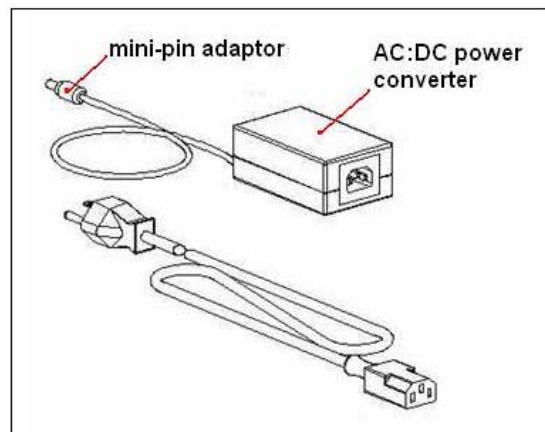
The single fluorescence system comes with a 1-colour variable light control. It allows using LED cassettes of any color. The adaptor power cable fits onto the 5-pin socket labeled “LED” at the rear of the control unit. Plug the mini-pin adaptor of the AC-DC power converter into the socket labeled “DC Input” at the rear of the control unit.



Attach standard power cord to power supply and plug into wall outlet.

Multiple fluorescence system with 3-colours variable light control

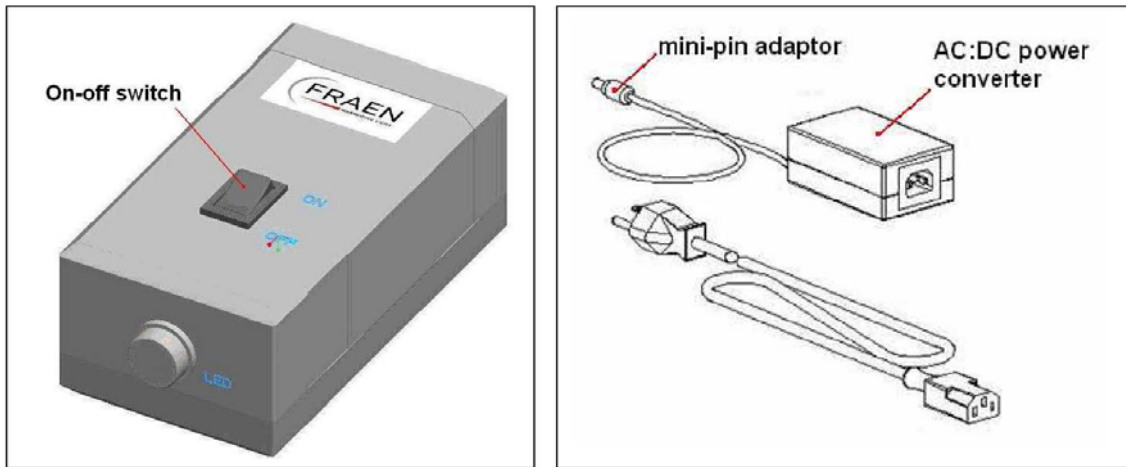
The multiple fluorescence system comes with a 3-colours variable light control. It allows using LED cassettes of any color. The adaptor power cable fits into the 5-pin socket labeled “LED” at the rear of the control unit. Plug the mini-pin adaptor of the AC-DC power converter into the socket labeled “DC Input” at the rear of the control unit.



Attach standard power cord to power supply and plug into wall outlet.

Easy Blue system with non-variable light control

The Easy Blue system comes with a single color non-variable light control. It allows using the Blue LED cassette which is powered at maximum intensity. The adaptor power cable fits into the 5-pin socket labeled “LED” on the control unit. Plug the mini-pin adaptor of the AC-DC power converter into the socket labeled “DC Input” at the rear of the control unit. Attach standard power cord to power supply and plug into wall outlet.



4 Operation

4.1 Adjust illumination on MLX-i microscope (please refer also to original operating manual for details)

The MicroLED fluorescence illuminator allows adjustment of illuminated field.

- 1) Switch on the MicroLED fluorescence illuminator.
- 2) Please ensure the 45° mirror is inserted on the left-hand side of the adaptor and the right emission filter is in place in the ring spacer.
- 3) Observe the field at low magnification, typically with a 10x objective: slightly move the condenser carrier up and down to increase the peak brightness.

4.2 Maintenance instructions, filter cleaning and handling information

The following instructions apply to MicroLED fluorescence module and its optical components. Please refer to original manufacturer's manual for instructions on microscope cleaning. Proper care and preventative maintenance should be performed and documented in order to ensure optimum performance. In addition, a thorough annual cleaning by a technical representative is recommended. The following general conditions apply:

A. Equipment should be kept covered when not in use

When neglected by exposure to dust, lint, pollen, and dirt, failure to remove immersion oil in a timely manner, or when expensive objectives are abused, optical performance can experience a serious decline that increases over time. Please use the microscope cover in order to provide maximum protection from airborne contaminants types: they are typically configured to adapt to the instrument with their common attachments. When the optical elements are dirty, damaged, or defective, artefacts are likely to appear in sharp focus superimposed on the specimen image.

B. Keep surfaces free from dust

An air blower or compressed gas duster can be employed. It must be assured that no oil or similar spray is released from the compressed gas can. Never attempt to blow the dust off lens surfaces with a strong breath because doing so risks spraying the lens surface with droplets of saliva that can mix with dirt to produce abrasive slurry.

C. Clean objective lenses, eyepieces and condenser daily, or after use

Use a high quality lens paper that has been dampened with an approved lens cleaner. Do not use Xylene, benzene or other chemicals. Dry lens paper can scratch the lenses. **DO NOT USE** commercial tissue or gauze. Oil can impose permanent damage to lenses (objective, ocular and condenser). It is important to recognize that immersion oils are not inert with respect to either optical or mechanical microscope components, and if left in contact with the instrument, oil will penetrate into gears and sliding mechanisms and into crevices between lens elements and their mounting structures, with the potential to cause irreversible damage. Even when employed properly, immersion oil must be removed immediately after use to prevent its accumulation in unwanted areas of the microscope, as well as to avoid optical degradation from dried oil residue on the objective. Immersion oil is most safely removed using only lens tissue, without employing any solvents. Lens cleaning paper that is specifically for use on high quality optics must be employed, and it should be stored in a covered container to prevent contamination with airborne particulates. Direct pressure from the fingers should never be applied to the glass lens surface through the paper in order to minimize the possibility of scratching the lens if any particulates are present on the tissue.

D. Excitation and emission filter cleaning and handling information

Avoid touching or wiping A/R (anti reflection) coated or metal mirror surfaces, avoid handling of exposed coatings with bare fingers.

Handle coated pieces by the edges only. Clean gently only if necessary.
Loose particles should be removed with a bulb puffer or filtered, pressurized air Cleaner.
If necessary, gently wipe surface using anhydrous alcohol and lint-free lab towels.
Use new surface of towel with each wipe

AVOID TOUCHING OR WIPING A/R COATED OR METAL MIRROR SURFACES**AVOID HANDLING EXPOSED COATINGS WITH BARE FINGERS****Product Orientation Instructions**

Proper orientation of the filter is necessary in order to minimize auto-fluorescence and maximize performance. There is a caret (arrow) located on the edge of each filter in order to aid orientation.

Emission filters should be placed with the arrow pointing toward the specimen, and away from the detector/eye.

5. FLUOROCHROMES & FILTER'S APPLICATIONS:

5.1 Fluorochromes

| Fluorochrome | Excitation max (nm) | Emission max (nm) | Fluorochrome | Excitation max (nm) | Emission max (nm) |
|--|---------------------|-------------------|------------------------------|---------------------|-------------------|
| Aminomethylcoumarin (AMCA) | 345 | 425 | Alexa Fluor 532™ | 531 | 553 |
| Alexa Fluor 350™ | 346 | 442 | Propidium Iodid (PI) | 536 | 617 |
| Hoechst 33342 | 347 | 483 | Rhodamine B | 540 | 625 |
| DAPI | 359 | 461 | Ethidium Bromide | 545 | 600 |
| Cascade Blue™ | 377 | 420 | Rhodamine | 550 | 573 |
| SpectrumAqua | 433 | 480 | Cy3 | 552 | 568 |
| Mitramycin | 450 | 470 | Tetramethylrhodamine (TRITC) | 555 | 576 |
| Acridine Orange, both DNA & RNA | 460 | 530 | XRITC | 582 | 601 |
| Auramine | 460 | 550 | Spectrum Red | 587 | 612 |
| Sulphorhodamine G Extra | 470 | 570 | Alexa Fluor 594™ | 590 | 617 |
| sgGFP™ (super glow GFP) | 474 | 509 | Texas Red™ | 595 | 620 |
| GFP wild type, non-UV excitation (wtGFP) | 475 | 509 | Bodipy 630/650-X | 625 | 642 |
| PE-Cy5 | 488 | 670 | Alexa Fluor 633™ | 632 | 650 |
| FITC | 490 | 520 | Allophycocyanin (APC) | 645 | 655 |
| Bodipy 492/515 | 490 | 515 | Alexa Fluor 647™ | 647 | 668 |
| Alexa Fluor 488™ | 495 | 520 | Bodipy 650/665-X | 647 | 665 |
| GFP (S65T) | 498 | 516 | Cy5.1 8 | 649 | 666 |
| GFP red shifted (rsGFP) | 498 | 516 | Cy5™ | 649 | 666 |

5.2 Applications of Filters

| | | |
|---------------------------------|--------------------------------------|-------------------|
| Tuberculosis | Blue (480) / Royal Blue (455) | Auromine O |
| Auto-immune | Blue (480) | FITC |
| Food / Meat Testing | Blue (480) | FITC |
| Education & Research | Blue (480) | FITC |
| | Green (535) | Texas Red |