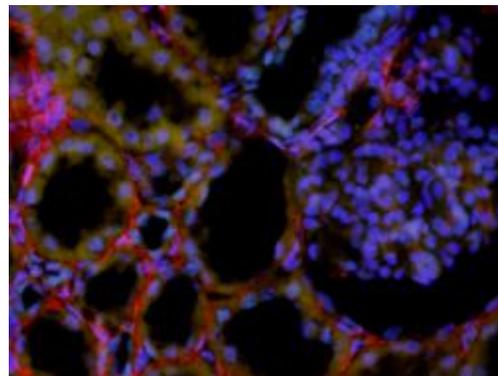
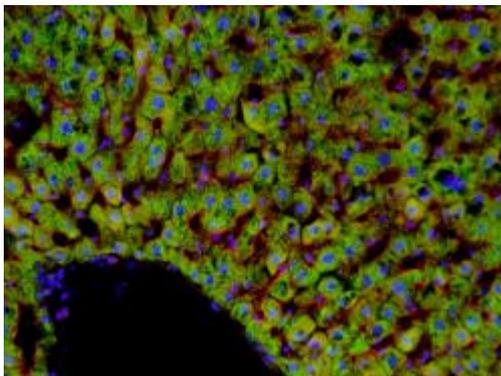
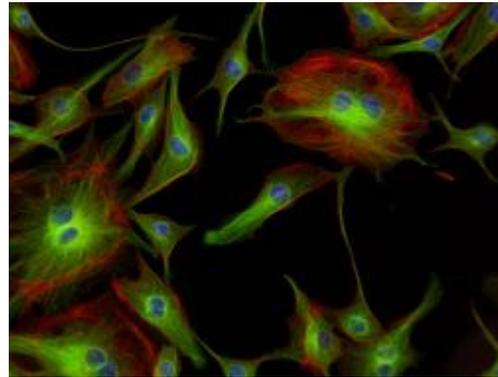
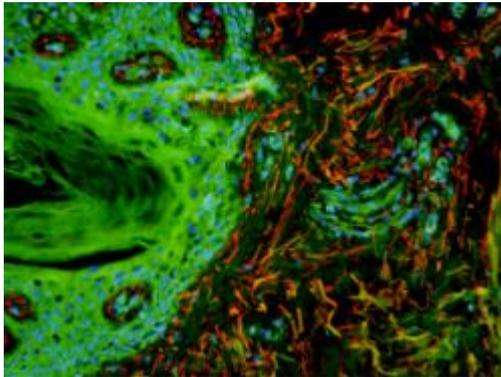
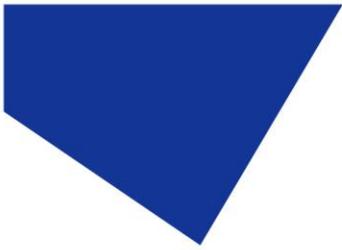


# User Manual

## pE-Universal Collimator

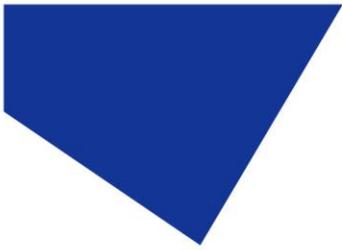
For epi-fluorescence microscopes





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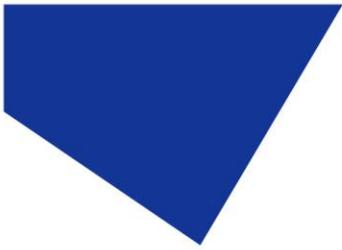


## 1. Introduction

CoolLED's pE-Universal Collimator is designed to take light emitting from a 3 mm liquid light guide and provide the necessary collimation for a broad range of fluorescence microscopes to create intense and homogeneous illumination over the full field of view. The adaptor uses the CoolLED modular adaptor ring system. This allows the mechanical fixing rings to be interchanged to suit the different fixing methods used by the microscope manufacturers. Adjustment of the optics is also provided as each microscope type requires different levels of collimation. Not all microscopes will be covered by this adaptor as there are a few designs which require highly convergent or divergent light which are beyond the scope of the adjustments. This document provides the details of the setting for those microscopes which are compatible, the majority which are in use today.

This manual should give you all the information required to setup and install your new pE-Universal Collimator.

Additional information may be found on our website at [www.coolled.com](http://www.coolled.com)



## 2. Safety Precautions

This product has been designed to operate with CoolLED's range of high intensity LED illumination systems where the light delivery method is a 3 mm light guide. While the light being emitted from the light guide is divergent (with a typical cone angle of 62 degrees), the intensity falls off rapidly with distance from the end of the light guide. Once the light guide is inserted into the pE-Universal Collimator, the light becomes collimated and so has the capability of maintaining its intensity over large distances. It is therefore necessary that certain procedures are strictly followed when installing and operating an illuminator using this pE-Universal Collimator. Failure to do so may result in personal injury or damage to other items.

### 2.1.

When installing this collimator, never switch on the light source until it has been securely fitted to the epi-fluorescence light port of the microscope. By following this basic safety rule, protection from the collimated light beam will be provided by the microscope itself, minimizing risk of injury and damage.

### 2.2.

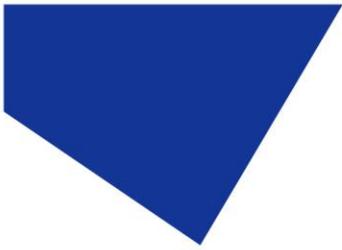
If for any reason the collimator is to be operated when not attached to a microscope, all personnel should wear eye shielding and clothing to protect the exposed skin.

### 2.3.

There are no serviceable parts within the collimator. Removing any of the screws and covers will result in the safety of the unit being impaired.

### 2.4.

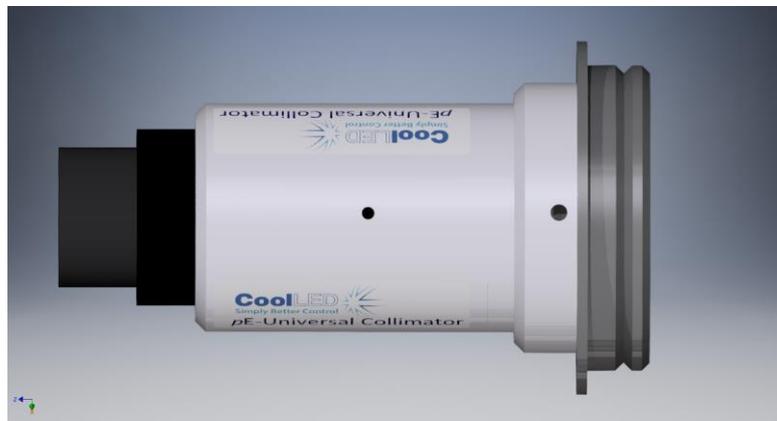
To clean the exterior of the collimator, use a slightly dampened cloth with a simple water/detergent solution only. Avoid the optical surfaces and lenses. Cleaning of optics should only be carried out using optical wipes and fluids.



### 3. Getting Started – System Components

The CoolLED pE-Universal Collimator is supplied with the following components:

1. pE-Universal Collimator
2. Microscope adaptor ring (normally fitted to the pE-Universal Collimator)
3. Two allen keys (not shown)
4. User Guide (not shown)



If any components are missing or appear damaged, please contact CoolLED immediately.

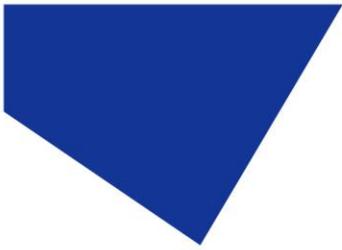
### 4. Installation and Setup

#### 4.1.

Carefully unpack the components from the shipping cartons.

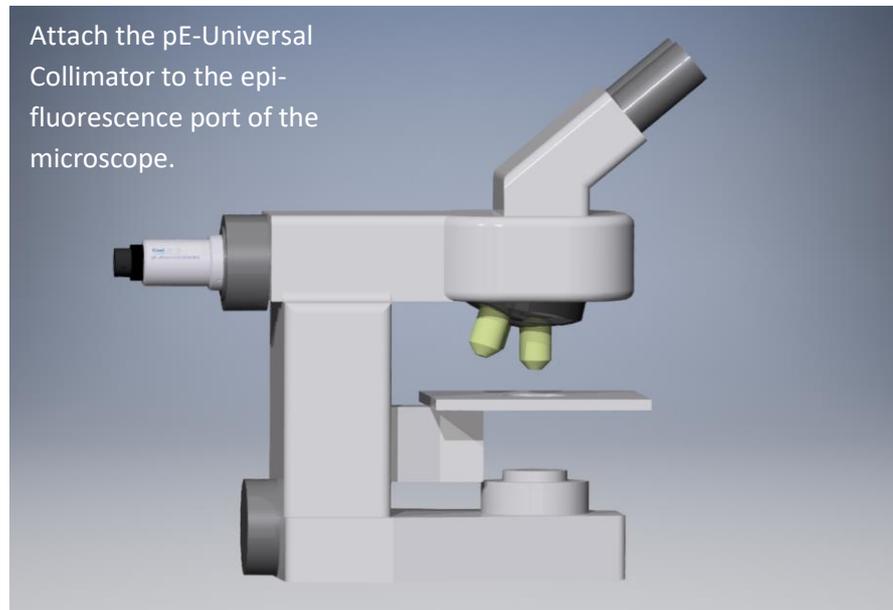
#### 4.2.

When ordered with a CoolLED Illumination System where the intended microscope has been specified, the pE-Universal Collimator will be supplied with the appropriate adaptor ring and have the optical adjustments preset such that it will be ready to fit to the microscope.



#### 4.3.

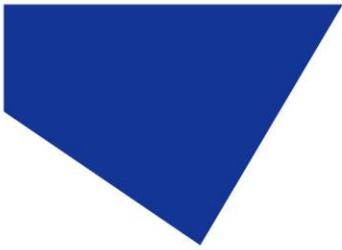
Now fit the pE-Universal Collimator to the epi-fluorescence port of the microscope and ensure that it is securely attached.



#### 4.4.

Insert the end of the light guide into the collimator.





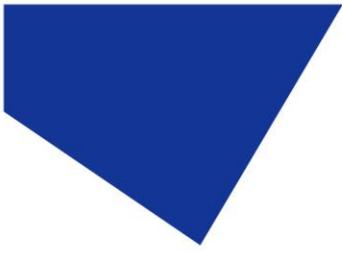
4.5.

Push the end of the light guide fully into the collimator and then tighten the grub screw to lock the light guide into position.

4.6.



No further adjustments should be necessary. Do not bend the liquid light guide through sharp corners. It is recommended to ensure a minimum bend radius of 75 mm.



## 5. Changing Microscope Adaptor Rings

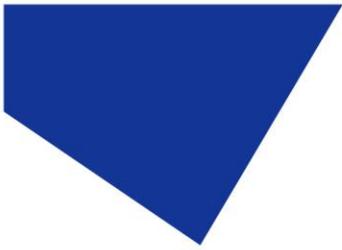
### 5.1.

If the adaptor ring needs changing, loosen the three grub screws as shown.



### 5.2.

Fit alternative adaptor ring and tighten grub screws. Do not over tighten as this can damage the internal rim of the adaptor ring if regularly changed.



## 6. Optical Adjustments to Preset Values

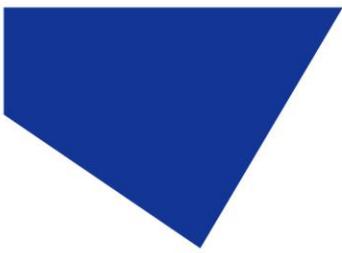
### 6.1.

In changing the microscope on which the illumination system is being used, it may be necessary to adjust the positions of the internal optical elements to optimise the homogeneity and power of the light at the sample. There are three optical elements to the pE-Universal Collimator: the light guide, a first (back) lens and a second (front) lens. The adjustments allow the changing of the distance between the light guide and the first lens – distance 'A', and the distance between the first and second lens – distance 'B'.

### 6.2.

The light guide is held in the light guide adjuster ring and adjustments to distance 'A' are made by rotating this ring.





6.3.

The first (back) lens is held in the central ring and adjustments to distance 'B' are made by sliding this in and out of the outer ring.

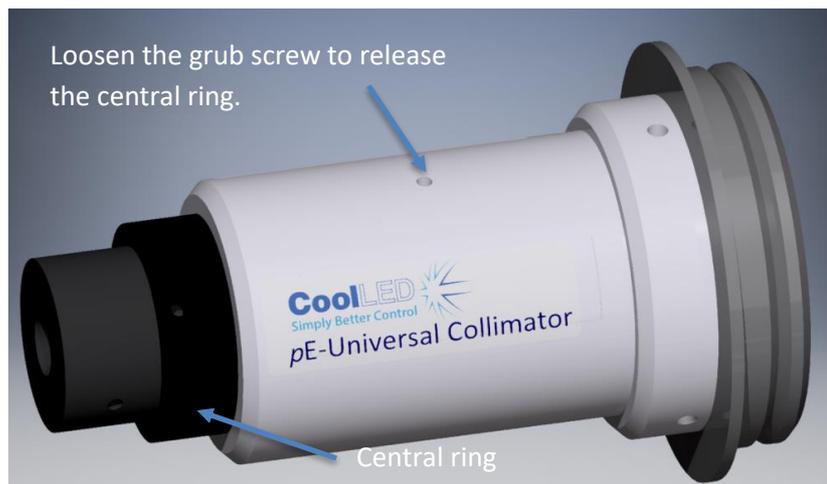


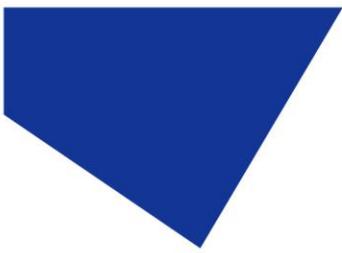
6.4.

To simplify the process, values for distances 'A' and 'B' are given in [Appendix 1](#) for the commonly used microscopes.

6.5.

Loosen grub screw to release movement of central ring.





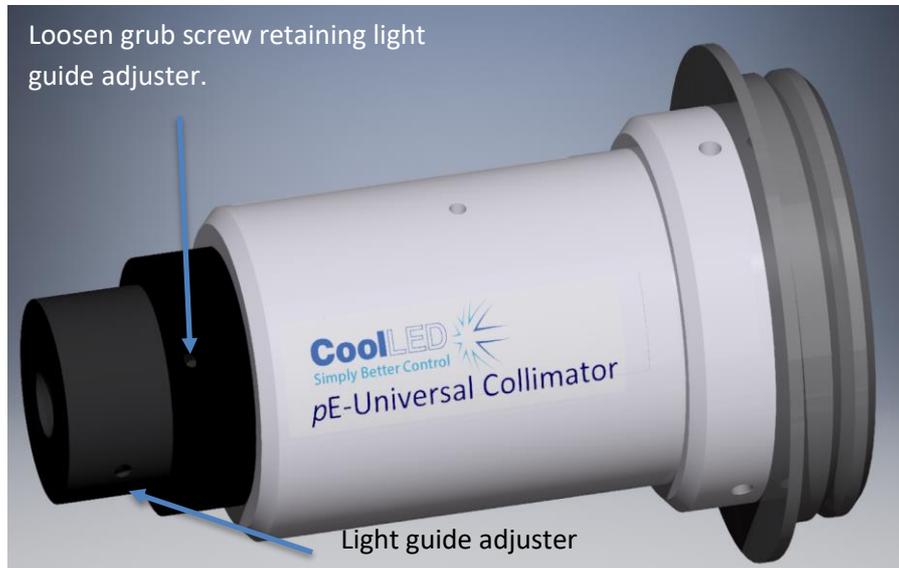
6.6.

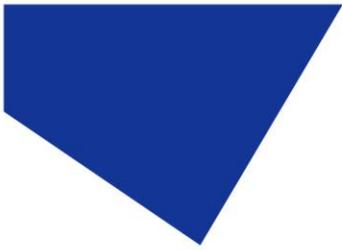
Draw out central ring as shown.



6.7.

Loosen grub screw retaining the light guide adjuster as shown.





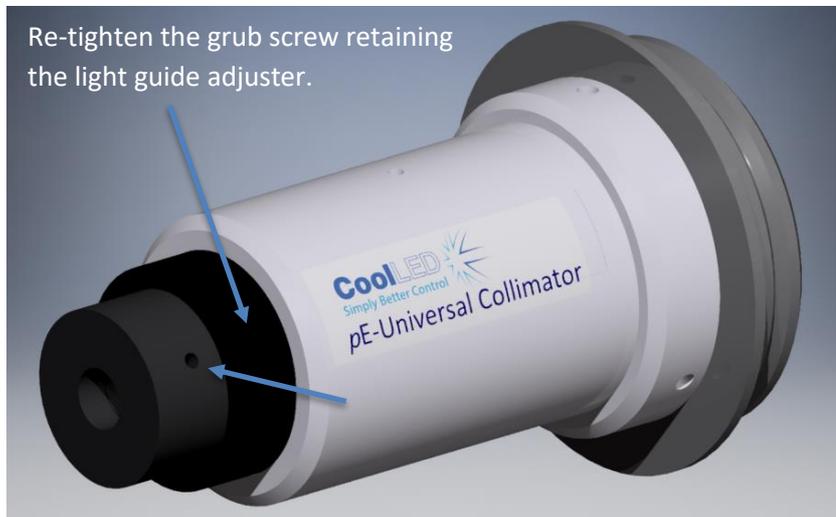
6.8.

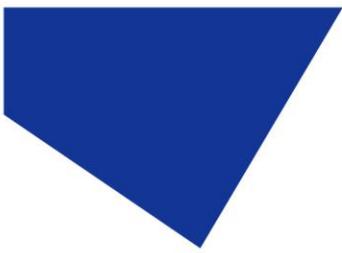
Hold the central ring with one hand and rotate the light guide adjuster to set the distance 'A'.



6.9.

Once set, re-tighten the locking grub screw. Do not over-tighten. It just needs setting to prevent the adjuster from rotating during service.





6.10.

Now draw out or push in the central ring to set distance 'B'.

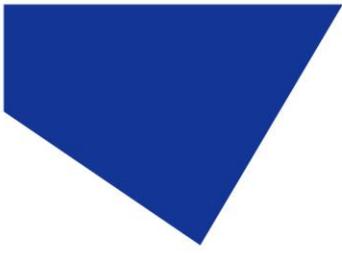


6.11.

Re-tighten the grub screw to lock distance 'B'. Do not over tighten, just sufficiently to prevent the central ring from moving during service.



The lenses are now set for the specific microscope.



## 7. Additional Optical Adjustments by Visual Judgements

### 7.1.

It is sometimes the case that the optimum settings for a specific microscope are not the standard ones given in [Appendix 1](#) due to the influence of different optical arrangements in the epi-fluorescence path of the microscope. To make adjustments, it is best to follow the steps given below to set for maximum brightness while maintaining homogeneity. Use a sample slide whose fluorescence emissions you are familiar with so that you can assess the changes caused by the adjustments.

### 7.2.

The best starting point is with distance 'A' set to a minimum. Follow [Section 6.8](#) and fully rotate the light guide adjuster clockwise.

### 7.3.

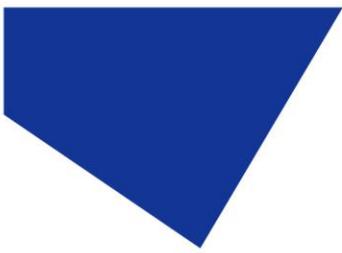
With the collimator attached to the microscope and the light source on, start with distance 'B' set at a minimum with the central ring fully inserted.

### 7.4.

Slowly draw out (increasing distance 'B') while viewing the emissions. The intensity should start to increase creating bright and full illumination. In many cases it should be possible to see the level of brightness reach a peak and then start to fade as distance 'B' is increased. When close to this peak, make small adjustments for maximum homogeneity over the full field of view.

### 7.5.

If when drawing out the central ring, a peak is not reached (i.e. as the ring approaches the end stop) the intensity is still increasing. Slide the ring back in and make an adjustment to 'A' by rotating the light guide adjuster counter clockwise by half a turn and repeat step 7.4. If there is still no peak, repeat again by rotating 'A' by another counter clockwise half turn. Follow this process until the brightness and homogeneity are optimised. Please note that when making adjustments to 'A', it will be necessary to release the grub screw which retains the end of the light guide to prevent rotary twists being introduced into the light guide. Make sure that after the adjustments to 'A' have been carried out, the light guide is fully inserted and the grub screw tightened to lock the end of the light guide.



## 8. Additional Optical Adjustments by Koehler Illumination Methods

### 8.1.

The most accurate way of setting the pE-Universal Collimator is to use Koehler illumination techniques. This involves ensuring that the output plane of the light guide, which is the effective source, is focused on the 'back aperture plane' of the microscope's objective lenses. This will ensure that the illumination has the greatest homogeneity at the sample plane and is very close to the point of maximum intensity. While this process is a little more complicated, it does ensure that the light source has been setup correctly and will only need to be carried out once for the life of the illumination system or microscope – in effect, many years.

### 8.2.

In order to create an object at the output plane of the light guide, it is recommended to draw a cross with a thin felt tip pen on the output glass of the light guide. This can easily be removed after the setup procedure has been completed.

### 8.3.

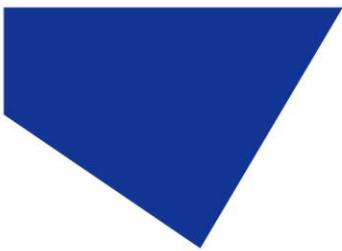
The 'back aperture plane' is normally at a position within the objective lenses close to their back surface, so it will be necessary to remove one of them to find this plane position. With an objective lens removed on an inverted microscope, take care not to stare into the beam of the excitation light source.

### 8.4.

The best way to find this plane position is with the use of the aperture stop of the microscope.

### 8.5.

With an objective lens removed and the CoolLED Light Source providing illumination across the passband of the excitation filter in the filter cube, close down the aperture stop. Insert a piece of paper or a fluorescence slide across the hole from where the objective lens was removed. Move the paper or slide up and down the optical axis until the edges of the aperture stop are in sharp focus. This is the 'back aperture plane'.



8.6.

Holding the paper or slide in this position, fully open the aperture stop and make adjustments to distance 'B' and if also necessary to distance 'A' (as outlined in [Section 7.3-7.5](#)), but in this case until there is a clear sharp image of the cross drawn on the end of the light guide at this 'back aperture plane'.

8.7.

Once this has been achieved, tighten up the grub screws to prevent accidental movement of the lenses. The light source and Collimator are now optimised for maximum evenness of illumination over the whole field of view for that particular microscope and this is very close to the point of maximum intensity.

8.8.

At the end of this process remember to remove the light guide from the end of the collimator and clean off the cross that was drawn on it as part of [Section 7.2](#). When returning the light guide to the collimator, ensure that it is fully inserted into the light guide adjuster ring before tightening up the grub screw.

## 9. Troubleshooting

The pE-Universal Collimator is a relatively simple item and is easy to set up and install. The following is a checklist if the product does not operate as expected.

9.1.

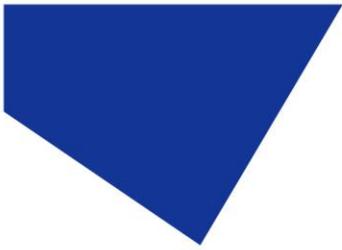
Symptom: Light guide will not insert into back of Collimator as shown.  
Check: Ensure that the locking grub screw is not preventing the light guide from being inserted properly.

9.2.

Symptom: After setting distance 'B', the central ring moves before the locking grub screw engages.  
Check: Hold the central ring in position for a few seconds, once distance 'B' has been set, to allow the air pressure differences within the collimator to stabilise.

9.3.

Symptom: There is not an even illumination over the full field of view.  
Check: Run through the setup procedure as outlined in [Section 8](#).



## 10. Routine Care and Maintenance

### 10.1.

The pE-Universal Collimator will require little or no maintenance throughout its life. There are no field serviceable parts so there is no need for disassembly.

### 10.2.

Cleaning of the external surfaces can be carried out with a mild soap and water solution used to lightly dampen a lint-free cloth. Ensure that no liquid is allowed to enter the product. Avoid optical surfaces.

### 10.3.

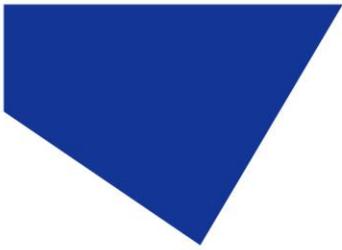
Cleaning of optical surfaces may be necessary if debris or fingerprints accidentally come into contact with the lens during installation.

### 10.4.

In the first instance remove any loose debris with an air duster (aerosol or rubber blower)

### 10.5.

Fingerprints or other liquid type contaminants should be removed using standard lens cleaning procedures. Do not flood the lens surfaces with fluid as liquid could enter the product and cause damage.



## 11. Fitting Universal Collimator to a Different Microscope

### 11.1.

To change microscope, it is a simple procedure of changing the adaptor ring and then following the instructions in [Section 4](#) of this guide.

### 11.2.

For information regarding the correct adaptor for your system, please visit our website at: <https://www.cooled.com/products/adaptors/>

## 12. Product Specifications

### 12.1.

Dimensions

Maximum diameter 68 mm (including adaptor ring).

Maximum length 135 mm (without light guide attached)

### 12.2.

Environmental Operating Conditions

Operating            5 – 35 °C

## 13. Product Options and Order Codes

See website ([Microscope Illuminators | LED Illumination Systems | CoolLED](#)) for full details of product options and order codes.



## 14. Warranty and Repairs

Please refer to CoolLED's current Warranty Policy available on our website <https://www.coolled.com/support/coolled-warranty/>. Although warranty terms are fixed at the time of ordering according to the terms and conditions of sale in place, the Warranty Policy may be subject to periodic change so please check to avoid confusion.

For any warranty queries or in the event of the product developing a fault, make contact with [support@coolled.com](mailto:support@coolled.com) for further assistance. You shall be asked to provide your microscope make and model, the product serial number and a brief description of the issue. You shall then be issued with a Support Case to manage your issue.

## 15. Compliance and Environmental

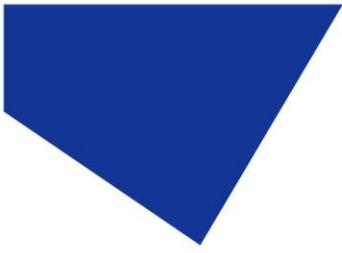
For current compliance statements and environmental information please refer to our website <https://www.coolled.com/support/environment/>

### 15.1. CoolLED's Recycling Program

At CoolLED, we recognize the importance of preserving the global environment. We are proud to provide a Recycling Program that enables CoolLED customers and end-users to send back used CoolLED Light Sources for recycling, free of charge.

Together we can reduce the burden on our environment through responsible disposal and recycling of End-of-Life Light Sources. You can help us by filling in our online contact form and providing us with your contact details and the serial number of the CoolLED Light Source that you wish to return and we will collect it free of charge.

If you are taking delivery of a replacement CoolLED Light Source, why not send the old one back in the packing box of the new one?



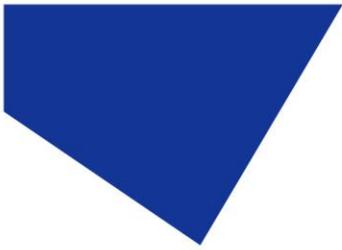
## 16. Contact Details

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UK

Phone                   +44 (0) 1264 323040           (Worldwide)  
                              1-800-877-0128               (USA + Canada)

Email                    [info@cooled.com](mailto:info@cooled.com)

Online                   [www.CoolLED.com](http://www.CoolLED.com)



17. Appendix 1

Microscope	Dimension 'A'	Dimension 'B'
Leica	13.0 mm	12.5 mm
Nikon	11.4 mm	12.6 mm
Olympus	15.4 mm	3.6 mm
Zeiss	12.0 mm	14.0 mm