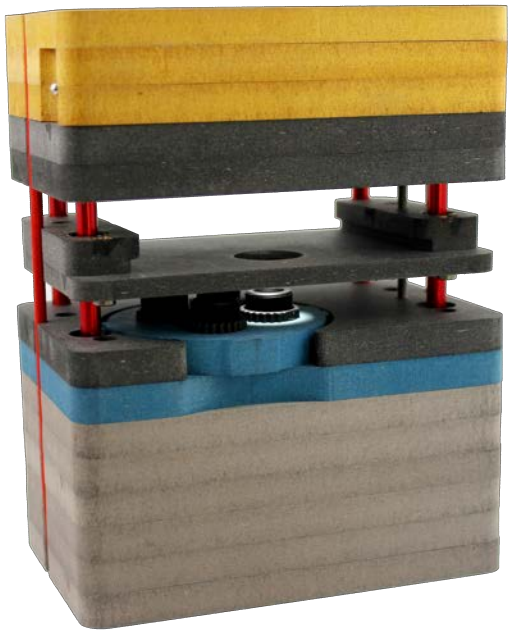

INSTRUCTION MANUAL

Curiosity microscope

Version : v1.x

Curiosity
microscope

SeaLabX

Curiosity microscope

Original Manual

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Knowledge of this manual is essential for the operation of the instrument. Please familiarize yourself with the contents of this manual and pay special attention to instructions concerning safe operation of the instrument.
The specifications are subject to change; the manual is not covered by an update service.

CONTENT

1. ABOUT THIS INSTRUCTION MANUAL

This Instruction Manual (further called "document") is considered to be part of the Curiosity microscope, hereinafter referred to as the "product" or the "microscope".
This document contains basic steps and safety information that must be observed during operation and maintenance. Therefore, the document must be read by the operator prior to commissioning and must always be available at the place of use of the product.
This document is an essential part of the product and, if the product is resold, the document must remain with the product or be handed over to the new owner.

1.1 Introduction

This product is a high-resolution digital microscope with a color CMOS sensor and USB 2.0 interface for light microscopy applications. To make it easier for you to set up the microscope, follow the instructions in these chapters step by step. In this manual the interface between the microscope and the computer / tablet / phone is called USB 2.0.

Content

This document contains all the information you need to set up the microscope, start the software, and perform troubleshooting and maintenance. It contains the following chapters:

Chapter	Content
About this instruction manual	Introduction and overview about this manual.
Safety	Important information on safe handling with the microscope. **Read this chapter before unpacking the microscope and putting it into operation.**
Technical data and conformity	Here you will find the microscope's technical data.
Shipment	The contents of delivery and optional attachments will be described here.
Assembling the microscope	In this chapter you will find detailed instructions on connecting and using the microscope.
Connecting the microscope	Here you will learn how to use software with your microscope.
Care and maintenance	This chapter describes some measures for the maintenance and care of your microscope. In case of greater damage, always contact SeaLabX support.
Troubleshooting	In this chapter we have listed some solutions to various problems. If you can not solve your problem, contact SeaLabX support.
Disposal	Information on the disposal of the product.

1.2 Text Conventions and Link Types

The names of controls and important information are shown in bold letters, for instance:

Example	Explanation
Click **Start**.	Software controls and GUI elements.
Press the **Standby** button.	Hardware controls and elements.
Press **Enter** on the keyboard.	Key on the keyboard.
Press **Ctrl + Alt + Del**.	Press several keys on the keyboard simultaneously.
Select **Tools > Goto Control Panel > Air- lock**.	Follow a path in the software.

Example	Explanation
Enter *example.pdf* in this field.	Text to be entered by the user.
`Programming and Macros`	Anything typed in literally during programming, including, for example, macro codes, keywords, data types, method names, variables, class names, and interface names.
See: *Text Conventions and Link Types [➟ 5].*	Link to further information for this topic.
https://www.sealabx.com/	Link to a website on the internet.

1.3 Explanation of warning messages and additional information

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

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

⚠ CAUTION

Type and source of danger

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

NOTICE

Type and source of danger

NOTICE indicates a potentially harmful situation which, if not avoided, may result in property damage. In addition, NOTICE warns of data loss or corrupt data as well.

INFO

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

2. SAFETY

2.1 Intended purpose

The product is a high definition microscope for color imaging. It is suitable for educational and routine microscopy in laboratory environments and for use by not specific trained laboratory personnel. The microscope has been designed to be used in the field of light microscopy for general observation, routine work, and simple applications in which a sufficient amount of light is available.
The microscope should only be used for training and research. The images / videos from this microscope must not be used for the direct generation of medical diagnostic results.

2.2 General safety information

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

- the operating personnel has read and understood this manual, associated documents, and particularly all safety regulations and instructions, and applies them.
- the local and national safety and accident prevention regulations must be observed, as well as the applicable laws and regulations in your country.
- this document is always available at the place of use of the product.
- the product is always in perfect condition.
- the product is secured against access by unauthorized persons.
- maintenance and repair work, retrofitting, removal or replacement of components, as well as any other intervention in the product not described in this document, may only be carried out by the manufacturer SeaLabX or persons expressly authorized by SeaLabX to do so. Moreover, the warranty and any claims thereunder will be voided.
- dirt and dust may affect the microscope's performance. Protect it by using a dust cover when it is not in use. Always make sure that the instrument is switched off before covering it up.

2.2.1 Requirements for operators

The product, components, and accessories may only be operated and maintained by authorized and trained personnel. The product may only be used in accordance with this document. If the product is not used as described, the safety of the user may be impaired and/or the product may be damaged.
Any unauthorized intervention or use other than within the scope of the intended use shall void all rights to warranty claims. The regional regulations on health protection and accident prevention must be observed at all times and during all work on and with the product.

2.2.2 Safe operating condition

If circumstances occur which impair safety and cause changes in operating behavior, the product must be shut down immediately and SeaLabX should be informed.
The product may only be operated if the operating conditions are adhered to.

- Do not operate the product until you have completely read and understood the entire documentation.
- Ensure conditions and take measures to prevent the build up of electrostatic charge on the workplace.

2.3 Prevention of hazards

This product has been manufactured and tested by SeaLabX according to the regulations specified in CE and has left the manufacturer's premises in perfect working order. The microscope is intended to be used in a basic electromagnetic environment. The performance might be impaired while integrated into a system. In order to ensure that this condition is maintained and to avoid any risks when operating the system, the user must comply with any notes and warnings contained in this manual. The manufacturer shall be exempt from statutory liability for accidents should the operator fail to observe the safety regulations.
Do not dispose of defective microscope in the household waste. Comply with the applicable statutory regulations for their disposal.
Specimens must also be disposed of appropriately in accordance with applicable statutory regulations and internal work instructions.

⚠ CAUTION

Personal injury

To avoid personal injury, read and adhere to the safety notes below.

- To avoid the risk of fire or explosion, do not use the microscope near inflammable liquids or gases.
- Setup, expansions, re-adjustments, alterations, and repairs must be carried out only by persons who have been authorized by SeaLabX.
- Do not allow any cables, particularly power cords, to trail across the floor, where they can be snagged by people walking past.
- Protect the cables from excessive heat.
- Do not position the equipment in a way that makes it difficult to operate or disconnect the device.
- Not for use alone by children under 8 years old.
  Adult supervision is required at all times for children using this product.
- This kit contains parts with functional sharp edges that could cut or seriously injure you, such as glass parts. Use caution when handling.
- This product contains small parts and small magnets. Do no put in your mouth or swallow. Small magnets can stick together across intestines causing serious infections and death. Take immediate attention if magnets are swallowed or inhaled.
- Keep batteries and magnets away from animals and children to prevent serious injury or death.
- Do not look at the included LED magnifier light source when adjusted to the bright setting. Doing so could cause a serious eye injury and disorientation.
- Do not eat or drink while conducting the experiment.

NOTICE

To avoid equipment damage, data loss, or corrupted data, read and adhere to the safety notes below.

- Protect the microscope against mechanical impact. External damage may affect the operation of inner components.
- Keep chemicals and fluids away from the microscope.
- Make sure there is sufficient ventilation of the microscope. Avoid direct exposure to sunlight and locations near heat sources (radiators, stoves). Overheating can cause noisy images.
- Use the microscope in a clean and dry location.
- Attach all connectors firmly and securely.
- Use only the accessories supplied by SeaLabX, when applicable.
- Use only normal microscope cleaning material to clean the microscope.
- Contact SeaLabX if a repair is necessary. Do not disassemble the microscope by yourself, otherwise the warranty will be lost.

2.4 Notes on the warranty

If you become aware of any deficiencies, please contact SeaLabX immediately and take all necessary precautions in order to avoid further damage. Upon notice of deficiencies, SeaLabX may choose to correct the deficiencies or to deliver a defect-free instrument at his discretion. Defects due to ordinary wear and tear (especially on wearing parts) and to improper handling are not covered by our warranty.

SeaLabX is not liable for damage to the instrument due to incorrect operation, negligence or any other manipulation of the instrument, in particular due to the removal or replacement of instrument parts or due to the use of accessories from other manufacturers. This will immediately void the warranty.

3. TECHNICAL DATA AND CONFORMITY

3.1 Curiosity microscope v1.x

Dimensions (length x width x height): 11 x 7 x 14cm
Weight: approx. 800g
Ambient conditions: Storage at permissible humidity (without condensation) max. 75% at 35 °C

Camera specifications:
Model NO.: ELP-USB4K02AF
Image Sensor: SONY CMOS IMX415 (1/2.8 ")
Max. Resolution: 3840 (H) * 2160 (V)
Sensitivity: 1000mV/Lux-sec
Pixel Size: 1.45μm x 1.45μm
Compression Format: MJPEG / YUY2 (YUYV)
Resolution and Frame Rate:
3840x2160 @ 30fps MJPEG / 2592x1944 @ 30fps MJPEG
2048x1536 @ 30fps MJPEG / 1600x1200 @ 30fps MJPEG
1920x1080 @ 30fps MJPEG / 1280x960 @ 30fps MJPEG
1280x720 @ 30fps MJPEG / 800x600 @ 30fps MJPEG
640x480 @ 30fps MJPEG / 320x240 @ 30fps MJPEG
3840x2160 @ 1fps YUY2 / 2592x1944 @ 1fps YUY2
2048x1536 @ 3fps YUY2 / 1600x1200 @ 5fps YUY2
1920x1080 @ 5fps YUY2 / 1280x960 @ 5fps YUY2
1280x720 @ 5fps YUY2 / 800x600 @ 20fps YUY2
640x480 @ 30fps YUY2 / 320x240 @ 30fps YUY2
Center Definition: 1000 LW/PH (center)
S/N Ratio: 30dB
Sensitivity: 0.65V/lux-sec @ 550nm
Minimum Illumination: 0.2 lux
Shutter Type: Electronic Rolling Shutter/Frame Exposure
Connection Port Type: High-Speed USB 2.0
AEC: Supported
AEB: Supported
AGC: Supported
Auto Focus: Supported
Adjustable Parameters: Brightness, Contrast, Hue, Saturation, Sharpness, Gamma, White Balance, Exposure
Lens Parameter: CCTV with Mount Thread: M12x0.5
Power and Connector: USB BUS POWER 4P Plug 2.0mm
Power Voltage: DC5V
Power Current: 200mA
PCB Size: 38mm × 38mm
Storage Temperature: -20°C to 70°C
Operating Temperature: 0°C to 60°C
Operating System Support:
Win XP/Vista/Win7/Win8
Linux with UVC
MAC-OS X 10.4.8 or later
Android 4.0 or later with UVC
Raspberry Pi

Brightfield observation via wired connection to Computer / Tablet / Phone.

INFO

Computer hardware, operating system and software may decrease the frame rates. Selecting a part of the sensor area or applying binning can increase the frame rate. All specifications are subject to change without notice.

Objectives:
CCTV Lenses M12x0.5 Thread Standard 25mm + alternative 16mm (2x), 8mm (5x), 4mm (10x), 2.1mm (20x).

Specifications:
25mm
Field of View: 27°
Focal Length: 25mm
Format: 1/2.5"
Mount Thread: M12x0.5
Aperture: F1:2.4

16mm
Field of View: 37°
Focal Length: 16mm
Format: 1/2.5"
Mount Thread: M12x0.5
Aperture: F1:2.0

8mm
Field of View: 40°
Focal Length: 8mm
Format: 1/1/2"
Mount Thread: M12x0.5
Aperture: F1:1.8

4mm
Field of View: 70°
Focal Length: 4mm
Format: 1/2.5"
Mount Thread: M12x0.5
Aperture: F1:1.8

2.1mm
Field of View: 160°
Focal Length: 2.1mm
Format: 1/2.5"
Mount Thread: M12x0.5
Aperture: F1:2.0

4 positions lens holder with ball bearing rotation and position holding by neodymium magnets.

Focus System:
Macro and micrometric.
Sample holder plate, dimensions 110 x 65mm, X-Y translation range 75 x 65mm, with slide/lid support option.
Plate with screw and gear movement with 0.1mm precision.

Lighting:
White LED; Brightness control via a three-position switch with 2 resistors located in the yellow module. 5mm round white LED with power of 22000 mcd (105mW), a 15° angle, current limited to 20mA, and a direct voltage of 3.2V. Color temperature: ~4000K.
Average LED lifespan, approximately 1000 hours.

Power supply:
LED powered by LIPO Battery.

Description:
Model: 802540
Capacity: 650mAh
Voltage: 3.7V
Size: approximately 44x24x8.5mm
USB charging time: approximately 2 hours (at 1A input)
Maximum required power: 7W

Structural material:
Made from Valchromat®.

Composition:
Wood: Pine wood
Resin: Melamine-Urea-Formaldehyde (MUF) resin, with low formaldehyde content (E1 class)
Wax: 65% paraffin emulsion
Colorants: Organic colorants
Valchromat® complies with standards and labels (CE, PEFC, FSC, ISO 9001). It meets the "toy" standard.
Valchromat® can be protected with Rubio Easy Déco® oil, depending on the device's configuration.
Features:

- 0% VOC: No water and no solvents directly after application
- Tested against EN 71-3 Toy Standard
- Suitable for kitchens and bathrooms
- Heat-resistant
- Non-classifying to fire M1

General description:
This digital microscope consists of stacked modules, each serving a specific function: a light source, a sample holder, lenses, and a camera. It can be assembled and disassembled in a matter of seconds. The modules are held in place by a simple elastic band. Plastic has been eliminated, and no glue is used. The structural material is made of Valchromat.
This microscope is available as a DIY kit or pre-assembled. Its kit-based design gives it a 100% repairability rate.

3.1.1 Camera spectral sensitivity

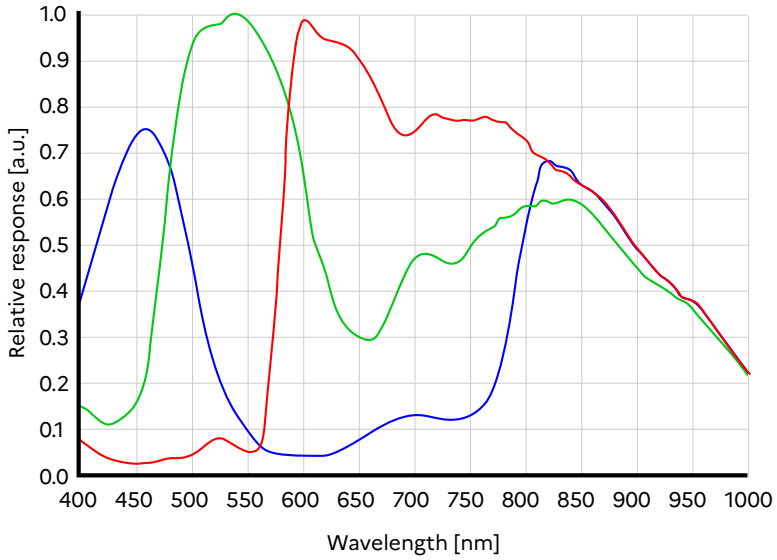


Fig. 1: Spectral Sensitivity IMX415

3.2 Applicable standards and regulations

Observe all general and country-specific safety regulations as well as applicable environmental protection laws and regulations. This product is in compliance with the requirements of the following regulations and directives:

2014/30/EU	Electromagnetic Compatibility
2011/65/EU	and amendment directive (EU) 2015/863 - RoHS - Restriction of the use of certain hazardous substances in electrical and electronic equipment
CE	The product fulfills the standards and regulations mentioned above and is compliant to the CE guideline

For more information on CE Declarations of Conformity, contact SeaLabX.

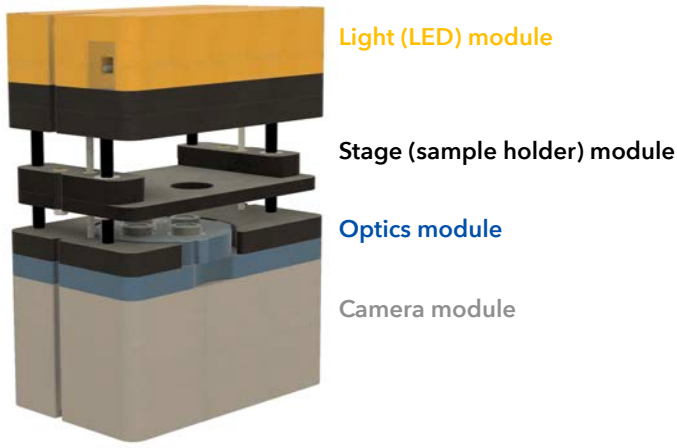
4. SHIPMENT

Content:

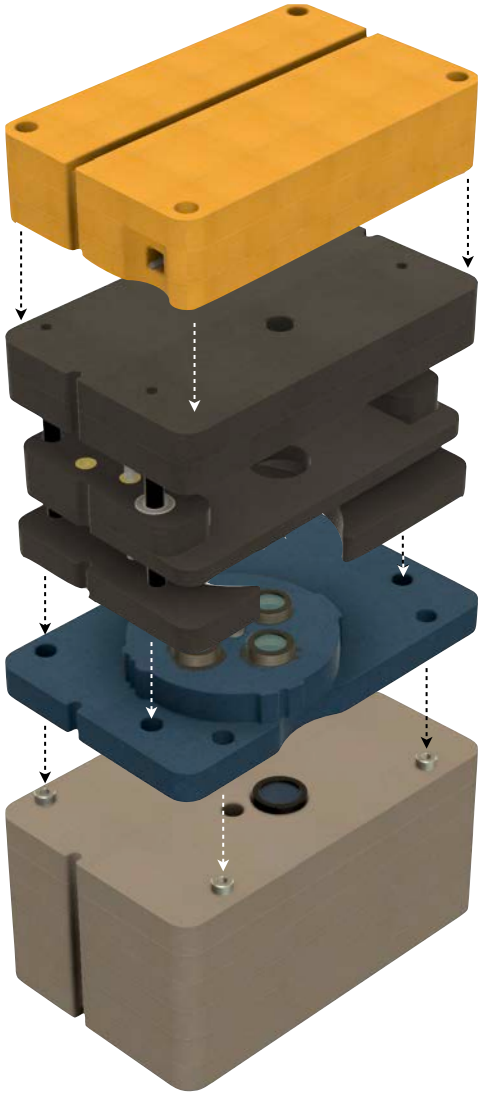
- 1 x microscope
- 1 x USB 2.0 cord
- 1 x yellow pelican box – Ext : L:35cm | l:28cm | h:14cm – *(in option)*
- 1 x optics cleaning kit – *(in option)*

5. CONNECTING THE CURIOSITY MICROSCOPE

The following figure shows a diagram of the microscope.



5.1. Assembling the Curiosity microscope



5.2. Connecting the Curiosity microscope with Computer / Tablet / Phone

1. Connect your USB cable to the camera module.
2. Find a USB port on the Computer / Tablet / Phone.
3. Plug the camera module into this USB port.
4. Turn the light ON.
5. Open your favorite camera software* and select this camera as video input.

The camera can directly connect with (Windows, MacOS, Linux, Android) via USB Port

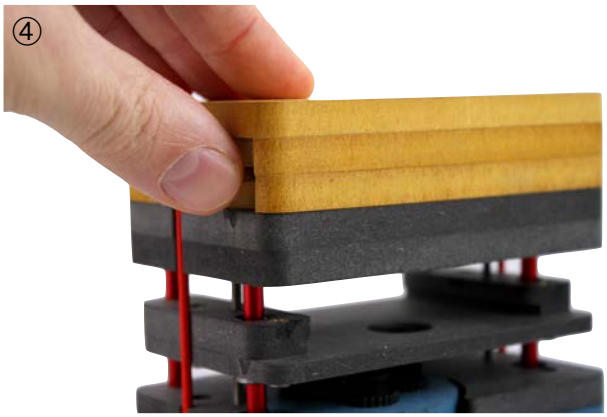
*General software used:
Camera App (PC), QuickTime (MAC), webcam viewer, IP camera viewer, VLC player, nExtCamera (Android), etc…
No driver installation is necessary.
The microscope can display images on Apple, Windows or Linux systems and can be used with any visio app.. The microscope switch ON automatically when connected to a computer using the provided USB cable.

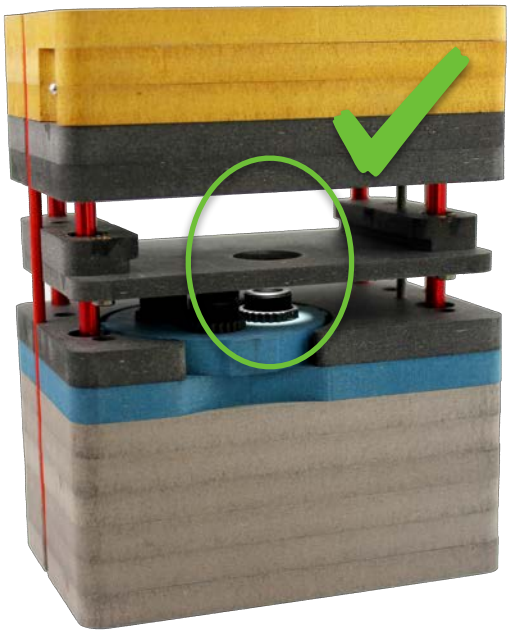
It is a good idea to charge the LED's battery before start. To do so, connect the LED module using the USB socket on the back of the module. Any USB chargers can be used.

①

②

④



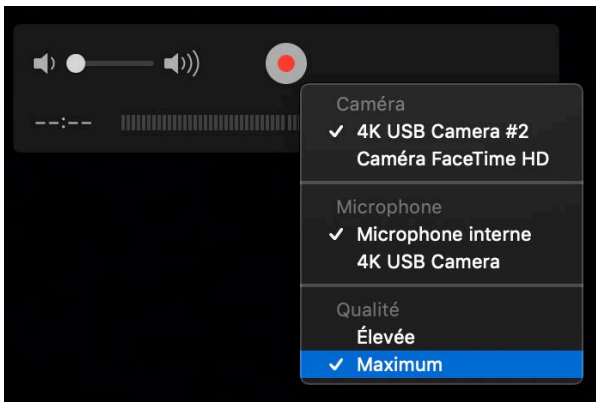


5.2.1 Using a Apple computer

a. Launch the QuickTime Player app from Launchpad

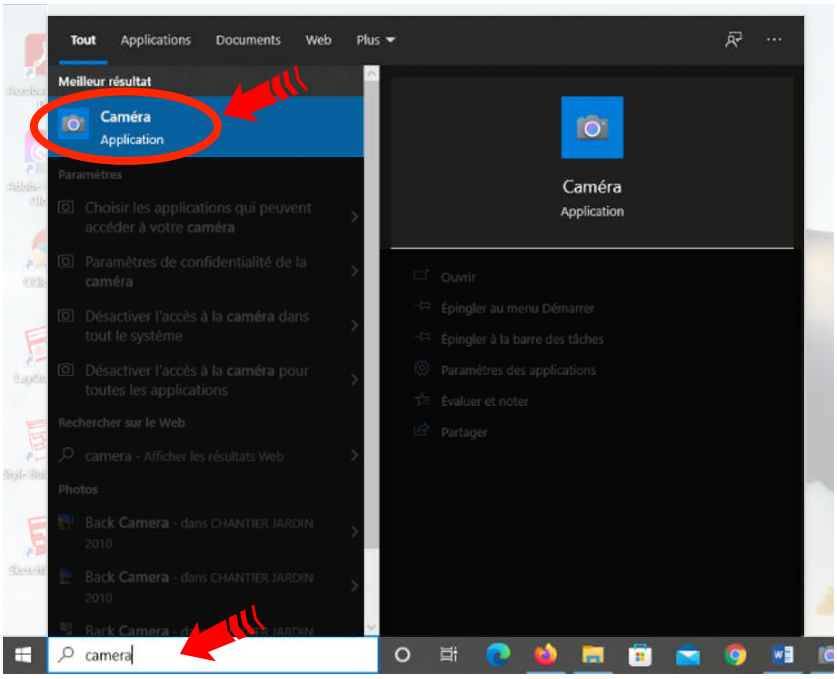
b. Select File / New video record (keyboard shortcut : ⌥⌘N)

c. Select the 4K USB Camera and check the Quality to Maximum

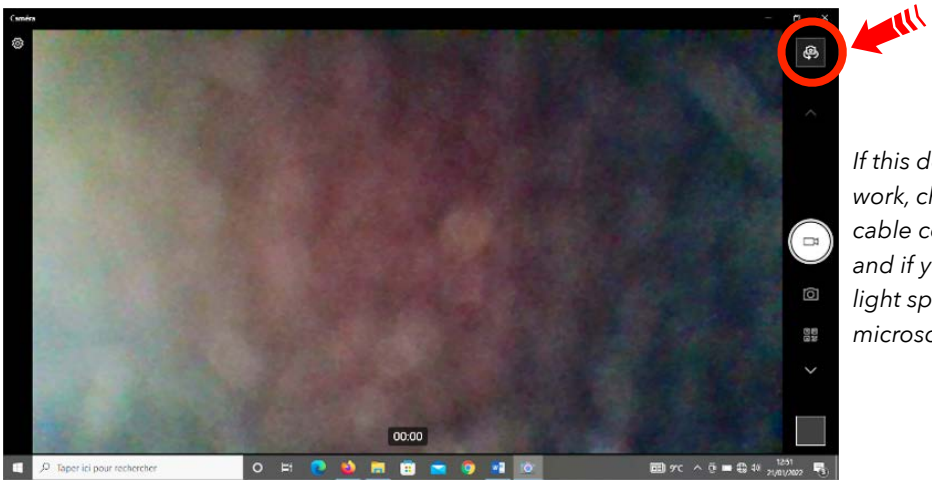


5.2.2 Using a Windows computer

a. Launch the Camera app



b. In Camera app select the right Source

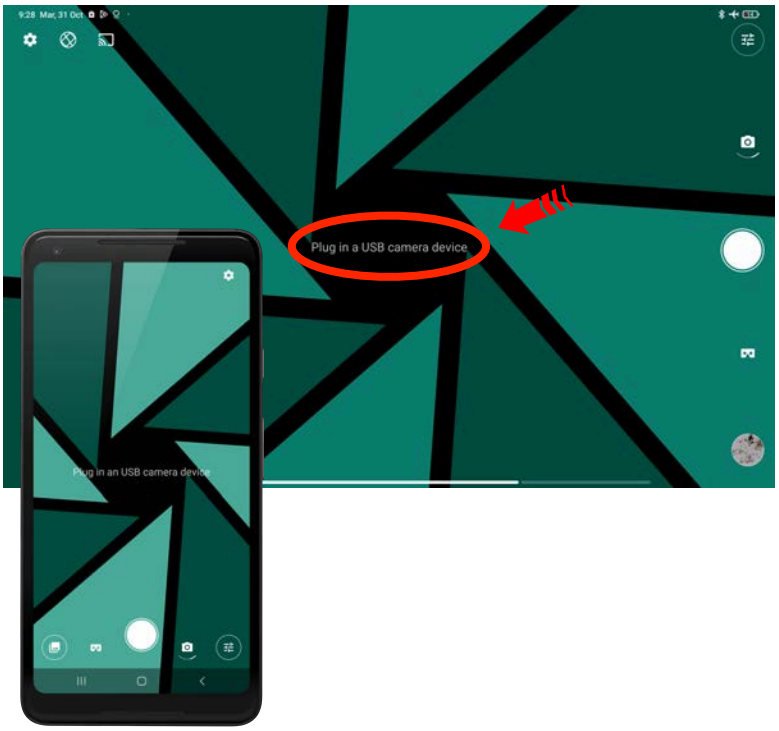


If this does not work, check the USB cable connection, and if you can see light spot on your microscope.

c. Your microscope is ready to use

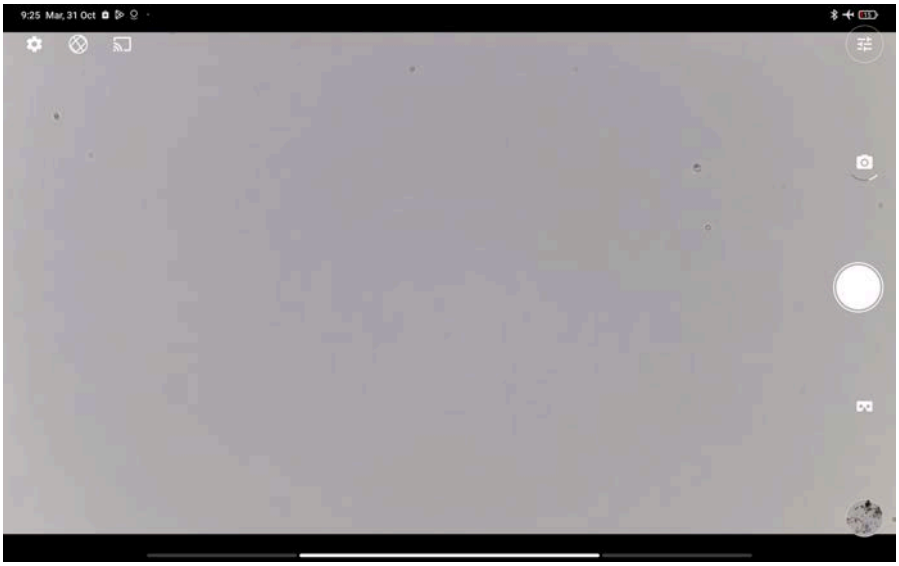
5.2.3 Using a Android Tablet / Phone

a. Launch the nExt Camera app



b. In nExt Camera app select the right Source and allow the device *4K USB Camera*

c. Your microscope is ready to use



5.3. Turn OFF the Curiosity microscope

1. Turn off the light
2. Disconnect the USB cable form your Computer / Tablet / Phone
3. Disconnect the USB cable from the microscope

6. TAKE IMAGES AND RECORD MOVIES

6.1. Good practices

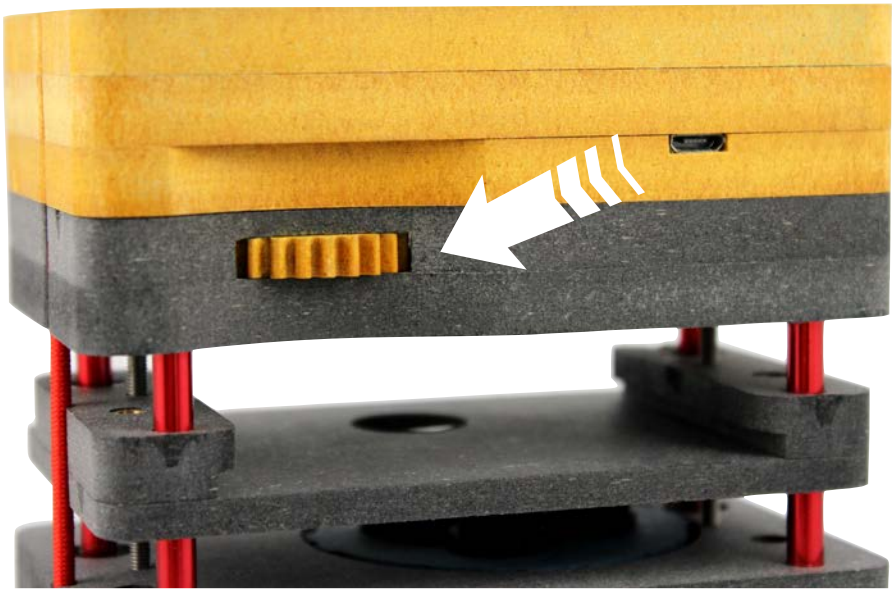
a. Switch on the top Led module using the light switch (3 positions : ON / OFF / ON)

b. Connect your computer to the microscope and get a live image from the microscope as described above in '*Connecting the Curiosity microscope with Computer / Tablet / Phone*'

c. You can test that the image is live by waving your finger between the Led module and the mobile stage, and watching the image change on the computer screen.

d. Place your sample on the mobile stage aligned over the illuminated lens. You might find it helpful to place your sample on a microscope slide, or a petrie dish since that makes it easier to move around. It is easiest to look at samples that are flat. When looking at thin samples, placing a cover slip on top helps to keep the sample flat.

e. The image will initially be blurry. To focus the microscope, turn the yellow notched wheel located on the sample support module to the left or to the right, until the image is sharp. The image will be clear when the objective is about 5 mm below the sample at the lowest magnification and about 1 mm below the sample at the highest magnification. To make focusing easier, we advise you to start with the lowest magnification and gradually increase it, this will allow you to gradually descend the moving stage to obtain a sharp image.



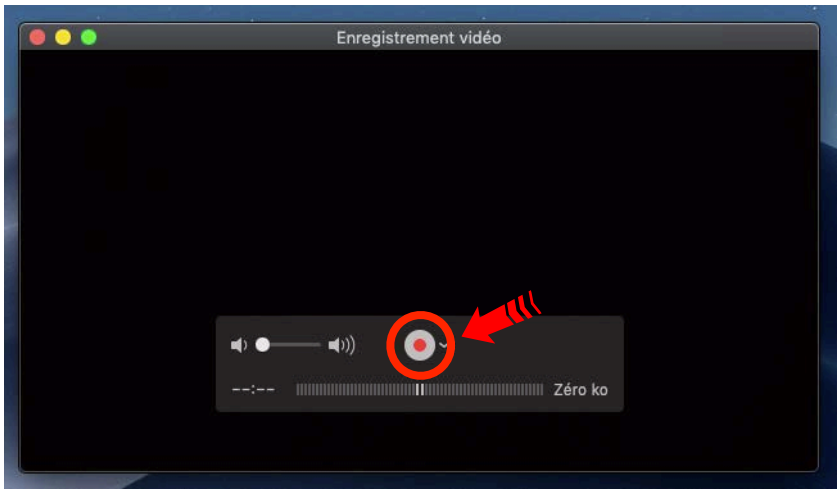
6.1.1 Using a Apple computer

a. The QuickTime Player app allow you to visualise live images without any other action.

b. When a shot or scene interests you, you have the option of taking a photo or video:

To take a photo, ① click on the « *Full screen* » button and them take a screenshot ②

To take a video, click on the « *Red* » icon.
Click on the « *Red* » icon to *Start* recording and then again to *Stop* the record.

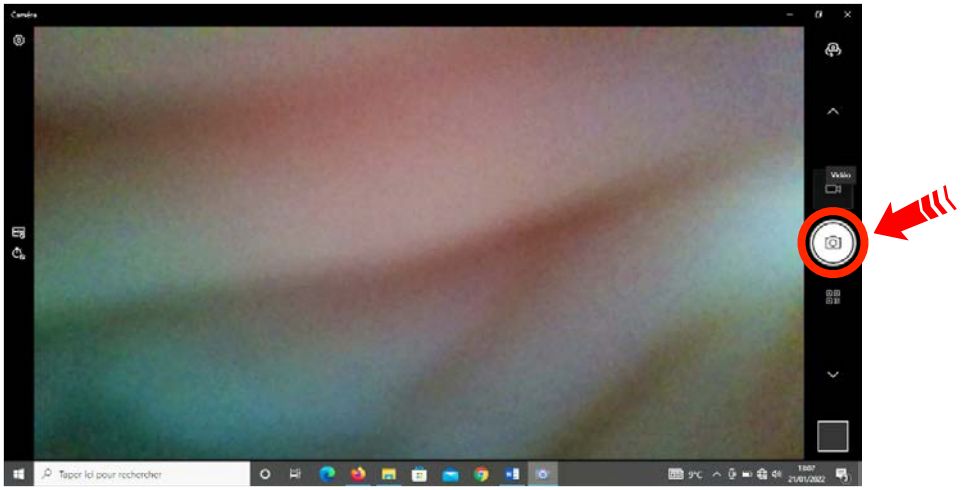


6.1.2 Using a Windows computer

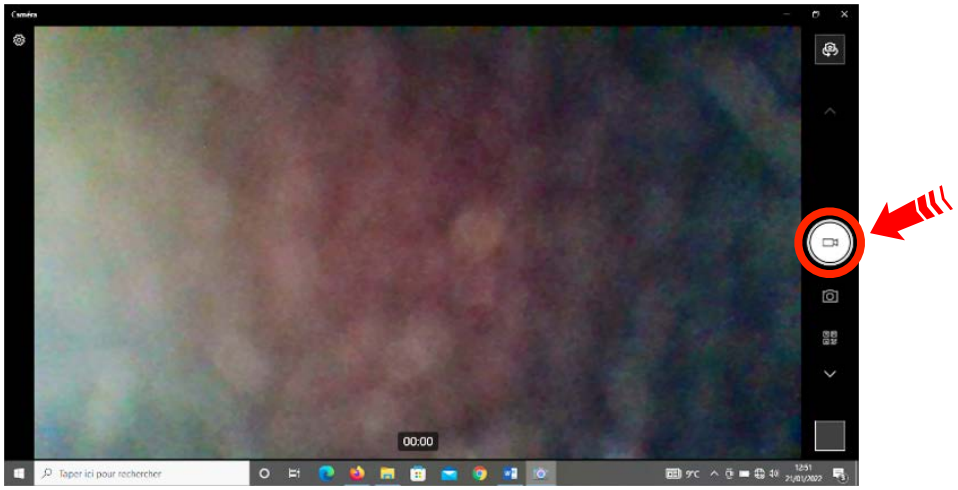
a. The Camera app allow you to visualise live images without any other action.

b. When a shot or scene interests you, you have the option of taking a photo or video:

To take a photo, click directly on the « *Photo* » button.



To take a video, click on the « video » icon above the « *Photo* » icon.
Click on the « video » icon to *Start* recording and then again to *Stop* the record.

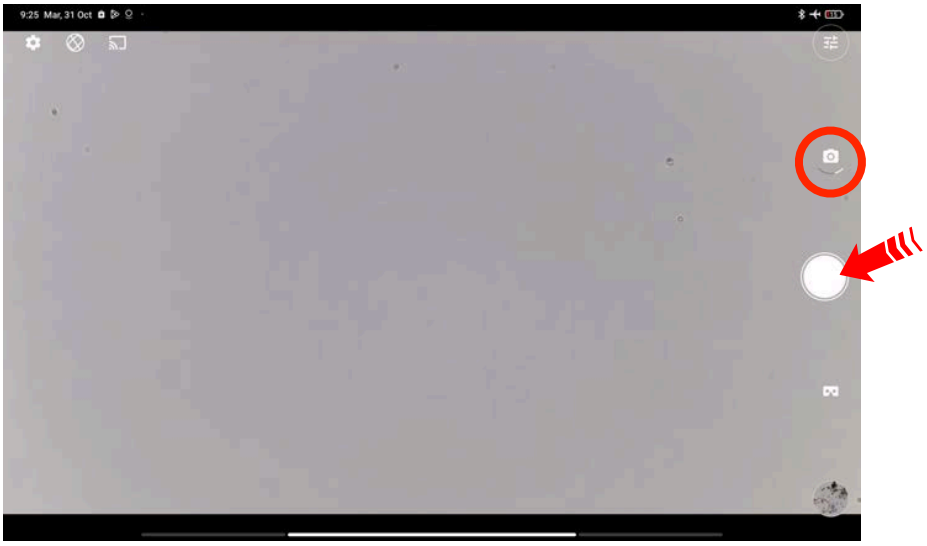


6.1.3 Using a Android Tablet / Phone

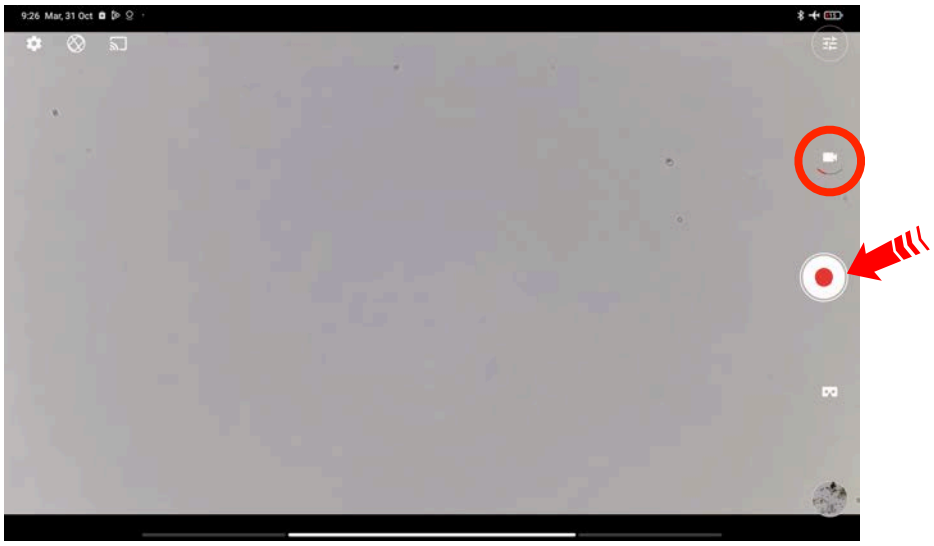
a. The nExt Camera app allow you to visualise live images without any other action.

b. When a shot or scene interests you, you have the option of taking a photo or video:

To take a photo, click directly on the « *Photo* » button.
To switch between video and photo mode, click on the « Photo / Video » icon.



To take a video, click on the « Photo » to switch to « Video » icon.
Click on the « Video » icon to *Start* recording and then again to *Stop* the record.



7. CARE AND MAINTENANCE

7.1. Charge the LED module

The microscope contains a small lithium battery in the LED module. The capacity of this battery allows it to be used for 12 to 24 hours non-stop, but sometimes it's good to think about recharging it.
Here is the procedure:

a. Connect your USB cable to the LED module
b. Connect the other part to any USB charger

7.2. Optical system

The internal optical components of the camera should always be protected. If no lens, or camera adapter with optics, is screwed into the camera's M12-Mount thread, the camera's sensor and protective glass must be protected by screwing a protective cap onto the camera's M12-Mount thread.

7.3. Cleaning the infrared filter or protective glass

Contamination of the IR filter or the protective glass has an adverse effect on the quality of the resulting image (dark points, cloudy structures in the image). If there is dry dust on the front side of the infrared filter or protective glass, you can clean it with a soft brush or with cotton (wool). Use cleaning fluid for optics/lenses only to clean the IR filter. Do not use tap water to clean the IR filter.

8. TROUBLESHOOTING

8.1. The camera does not appear in the menu of selectable cameras

- Make sure the USB 2.0 cable is well connected to the microscope and Computer / Tablet / Phone.
- Make sure you used the appropriate software in accordance to the instructions in this manual.
- Make sure camera is powered on and reconnect the USB cable to the Computer / Tablet / Phone.
- USB cable is not suitable. Use the USB cable provided in the original package (Power & Data).

8.2. You don't see a camera image on your screen

- Check if you have started the acquisition software.
- Check the light module is on and you can see light on the objective of the microscope.
- If not, check the charge of the LED module.
- Reset the camera parameters to default/low values.
- Execute an automatic exposure measurement.
- Check the display adjustments for the live image.
- Check the position of the lenses.

8.3. The color of my image is pinky

- Check white balance and, if necessary, repeat white balance.
- Check the monitor's color temperature setting. If necessary, reduce this to the lowest value that can be set (usually 5200 K).

8.4. The performance of the camera is not consistent or is too slow

- Generally the performance of the camera is dependent on the performance of the PC / Tablet / Phone. Make sure the PC / Tablet / Phone hardware and setup are optimal for large data transfers.
- Check that the camera is connected to the USB 2.0 or USB 3.0 interface, and not USB 1.0.
- Make sure no other devices are plugged into the USB interface card. This can potentially reduce the speed of the USB port.
- Dirt or dust on the optical surfaces of objectives or filters. Clean the respective optical components.

9. DISPOSAL

Lithium-ion batteries should NOT go in household garbage or recycling bins.
Lithium-ion batteries SHOULD be taken to separate recycling or household hazardous waste collection points.
Electrical items like camera should not be put in the bin, you can drop it off at your local Recycling Centre.
Wood parts can go in household garbage or recycling bins.

INSTRUCTION MANUAL

SeaLabX