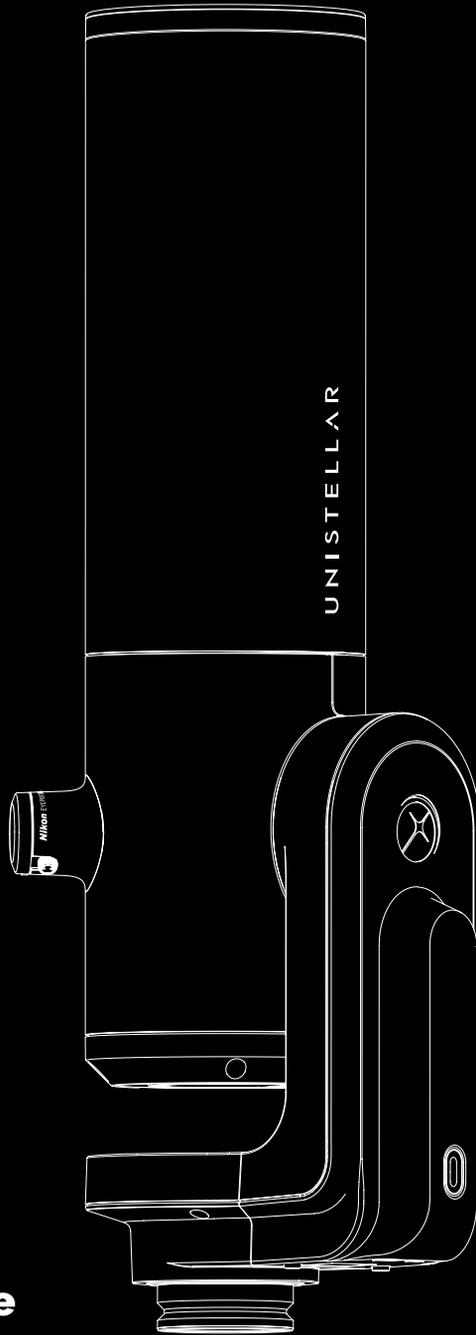




**The Universe  
Awaits.**



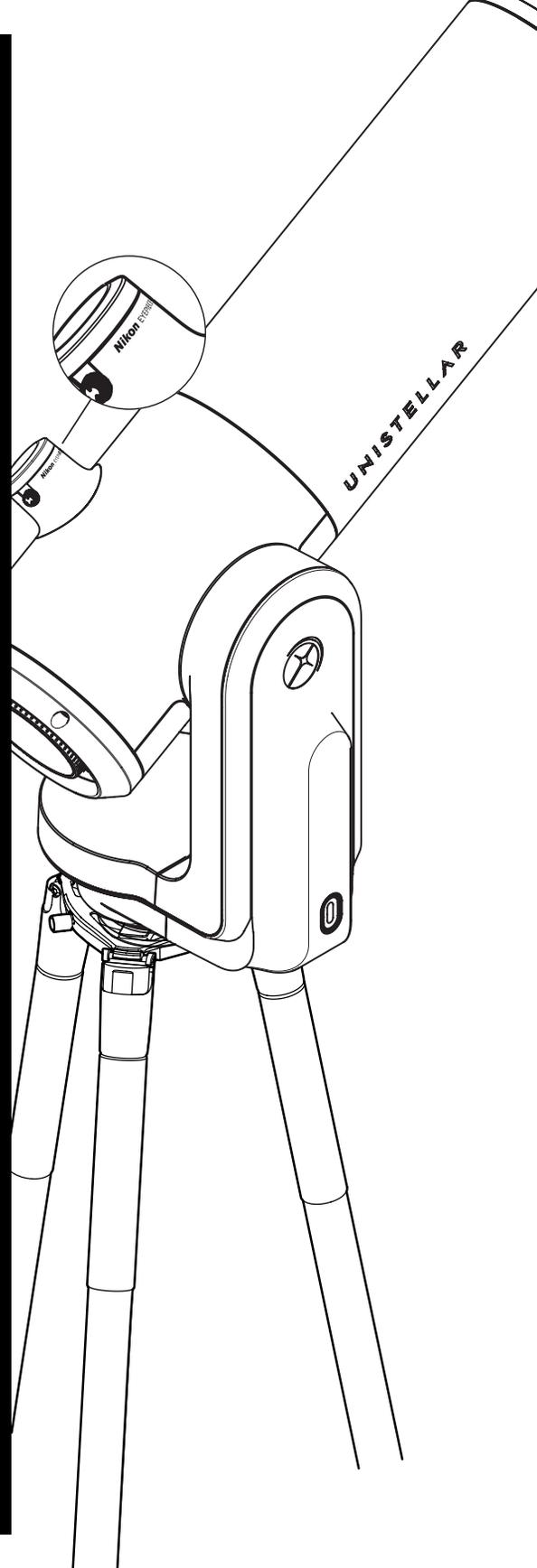
**User Guide  
eVscope 2**

## Who is this user guide for ?

This guide is for all Unistellar community members and users, whether you are a beginner or experienced, an astronomy enthusiast or simply excited to make new discoveries. This guide will ensure you properly set up your telescope and observe in good conditions, to get the most out of your eVscope 2, including beautiful images.

## How Is it organized ?

In this user guide, we will walk you through every feature and setting, step by step, to optimize the use of your telescope. You will learn how to get the best experience possible every time you observe the sky. You will also learn about Unistellar's mission, as well as the science projects you can participate in.



# Summary

## User Guide

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# ● Introduction

## Unistellar's Mission

Unistellar was founded in 2017 by two former PhD students of the 2018 Physics Nobel Prize winner, a visionary industrial engineer, and a world-famous Californian astronomer. All of them share one common desire: to make astronomy more accessible and exciting for everyone - and ultimately to bring the Universe closer.

Unistellar is disrupting the astronomy market with consumer telescopes that are easy to use and powerful enough to allow you to experience the beauty of space and make scientific discoveries. This fun and educational instrument gives access to thousands of targets, while traditional optical telescopes only allow for a few objects to be seen clearly. Unistellar telescopes are the most portable, simplest and fastest to operate, whether from an in-town balcony or the countryside.

Our telescopes provide an unparalleled user experience : they are very easy to use, ready in a few minutes, controlled by your smartphone, and able to automatically point at thousands of objects from our catalog.

Unlike other telescopes, our community of users can easily upload and share their data. This allows for new experiences such as crowd-sourced pictures of the sky or the transmission of valuable scientific data to professional astronomers.



WARNING

**FORBIDDEN !**

**Never use an eVscope 2 to look at the Sun without an adapted filter !**

Looking at or near the Sun will cause irreversible damage to your product.  
Do not point the telescope at or near the Sun.  
Children should always have adult supervision while observing.

**WARNING !**

**Never charge the eVscope 2 if the temperature is under 10° Celsius.**

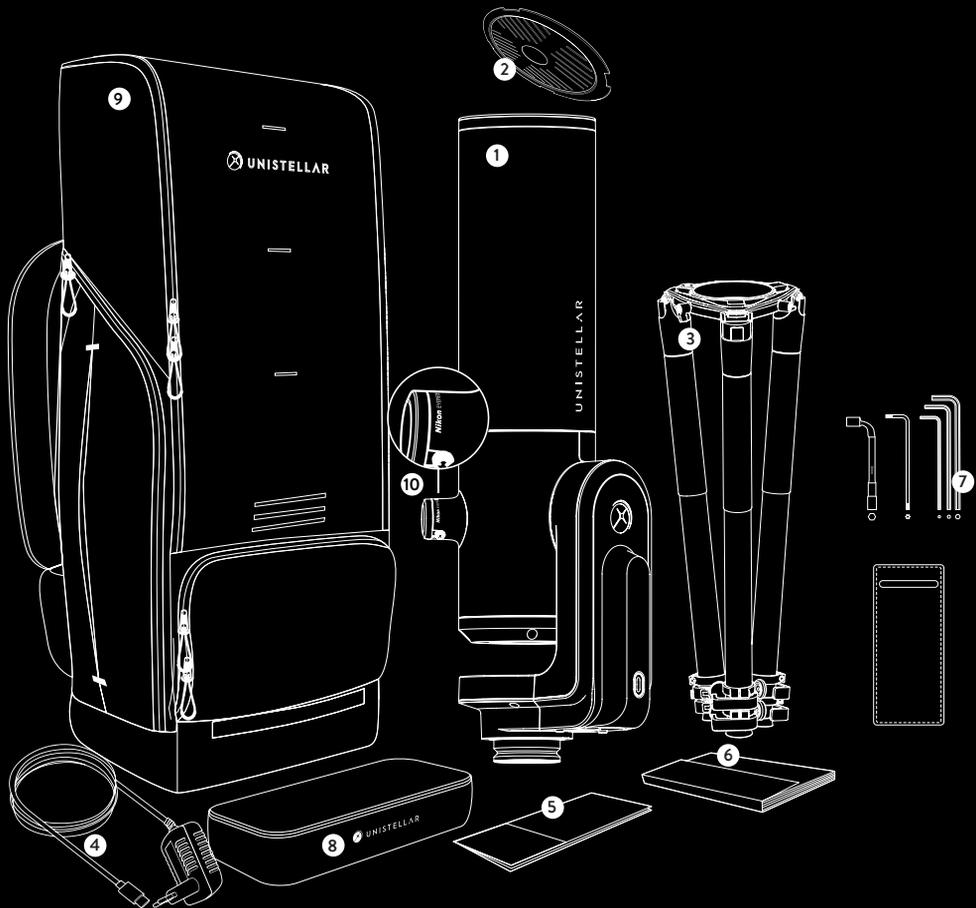
It could cause irreversible damage to the eVscope 2's battery.  
Always charge it between 10°C and 40°C (40°F and 104°F).

**WARNING !**

**Never let the eVscope 2 with the battery plugged in without using it for more than a month.** It could cause irreversible damage to the eVscope 2's battery. Always unplug the battery for long storage.

# BOX CONTENT

- 1 eVscope 2
- 2 Bahtinov mask (located in the cap cover)
- 3 Tripod + cylindrical black foam to keep in case of return
- 4 Power supply with adaptable plugs (EU, USA, UK, JP)\*
- 5 Quick start guide
- 6 User guide
- 7 Accessories box with tools  
Tripod Tool 1 (Socket wrench 8mm) / Tripod Tool 2 (Allen Key M5.5) Tripod Tool 3 (Allen Key M4) /  
Telescope Tool 1 (Torx Key T20) / Telescope Tool 2 (Allen Key M3)
- 8 Removable cover + 2 spare screws for the tripod
- 9 Backpack
- 10 Tube Dust cap & eyepiece cap



\*Except for Australia, New Zealand, Hong Kong & Singapore (power cable only)

# Before you start:

Everything you need to know about the eVscope 2

## The eVscope 2

### What is the eVscope 2 ?

User-friendly, smart and autonomous, the eVscope 2 is the perfect grab-and-go telescope. Safely and easily transport the eVscope 2 and tripod in its backpack.

### What makes the eVscope 2 user-friendly?

The Enhanced Vision (patented technology) and the Autonomous Field Detection.

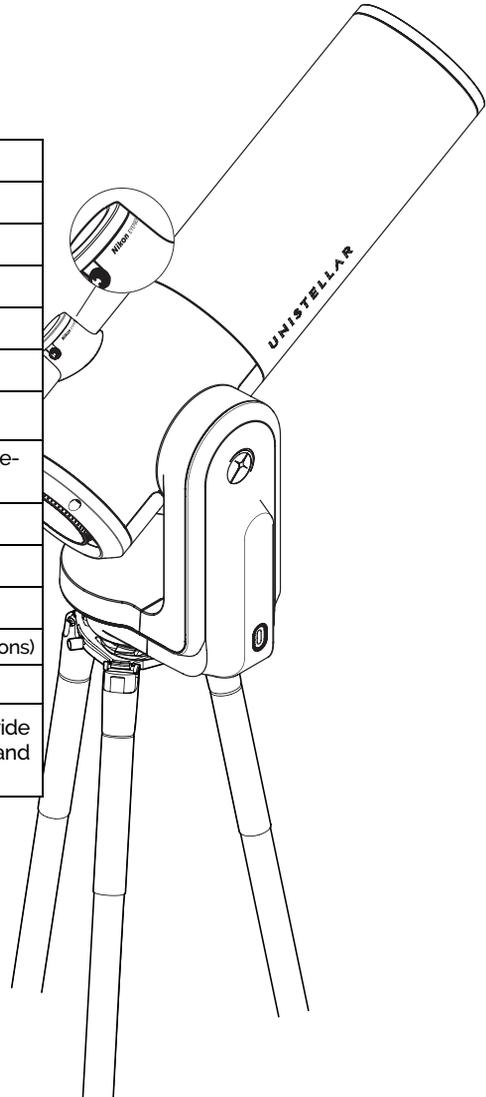
**Learn more about these features in section 4 - Get the most out of your eVscope 2.**

When you receive your package and open it up, you will see a cylindrical black foam with a red tape placed in between the mirror mount of your Unistellar telescope and the onboard computer. The easiest way to do so is by pushing it out from the back and it will slide on the side.

### eVscope's characteristics:

Aperture	114 mm (4,5 inches)
Computerized	Yes
Resolving power	1.33 arcseconds
Focal Length	450 mm (17,7 inches)
Focal Ratio	f/3,9
Mount	Alt-Azimuthale
Optical Design	Newtonian
Sensor	IMX347 low read noise 1 e- (trademark of Sony®)
Sensor field of view	0,75 x 0,56°
Weight	9 kg (19,8 lbs)
Mirror reflectivity	92-96%
Max magnitude	16 (up to 18 in best conditions)
Eyepiece	Nikon "Viewfinder"
Measurements	65cm tall and 23cm wide (25,5-inches tall and 9-inches wide)

**⚠ Warning:** the eVscope 2 cannot be mounted on any other tripod



## The eyepiece

### What is the eVscope 2 eyepiece ?

The technology OLED display has extremely high-contrast with True black, with an optical setup designed to stream the sensor's view. The result: mind-blowing visual quality for your observations of the dark sky.

### How to use it?

You can adjust the dioptre and sharpen the image based on your eyesight, especially if you wear glasses or contact lenses by rotating the side knob counterclockwise fully, followed by 3 to 4 clockwise turns until perfectly adjusted to your sight.

The field of view cannot be changed, even with a Barlow lens.

## The battery

The eVscope 2 comes fully charged and ready to use.

### What is the eVscope 2 battery ?

Battery's characteristics: Lithium-ion (6 x 18650, 15 Ah) - lasts up to 9 hours.

A rechargeable Lithium-ion internal battery is built into your eVscope 2. The battery can be replaced in the event of malfunction or permanent damage.

### How to charge the battery ?

Use the enclosed USB-C charging cable and power plug adapters to plug your eVscope 2 into a power outlet. A power bank can be used to charge your eVscope 2 as well (we recommend a USB 5V).

For the most efficient charge of the battery, the maximum current used by the eVscope 2 is 2.4 Amps. For the charge range we recommend  $>2A$ . 1A will also work but the charging time will take longer.

### What does the blue flashing light indicate ?

While charging, the LED located on the power button flashes blue. As the battery is charging, the number of flashes will decrease. When the battery is fully charged, the LED is steady blue. Your Unistellar App also indicates battery levels.

Avoid "fast charging" technology (9V, 12V); it may not charge the battery (and charger may not be detected).



**For long term storage, we recommend charging your battery to 70% and charging it at least every six months. Keep your telescope disconnected, and away from heat and moisture. Recharge your eVscope 2 fully before your next observation.**

Partial battery discharges are healthier for your device than long discharges: high discharge rates contribute to damage and strain on Lithium-ion batteries.

### What if my power supply is damaged ?

If damaged, the charger is a standard one, you can use a USB-C USB cable. Use a good quality power supply.

**Can I use my telescope while charging ?**

Yes. The charging time may vary from 6.5 hours on OFF mode to 8 hours while operating.

**⚠ Warning:** do not charge the battery if the temperature is below 10°C (50°F).

**The LED****Where is the LED located on the eVscope 2 ?**

The LED is on the Power / ON button.

**What does each color mean?**

**Purple:** eVscope 2 software ON or OFF (for a few seconds)

**Red:** eVscope 2 ON, ready to use, operational

**Purple and blinking 5 times:** eVscope 2 OFF with not enough charge to turn ON (charge it)

**Blue and blinking:** eVscope 2 OFF and charging (will blink from 6 times: fully discharged to steady blue: fully charged)

**Yellow and blinking:** eVscope 2 updates in progress

**Green and blinking :** transfer in progress

**Orange:** data transfer has failed

**White:** an error has happened, reboot your eVscope.

**The tripod**

Made for deep sky observations, it has a bubble level at the top of one of three multi-angle leg locks, near where the eVscope 2 is secured. Make sure your tripod is accurately leveled or your observations will be slightly inaccurate.

**IMPORTANT:** make sure to fully tighten the screws on your tripod, but not overly-tighten them which can strip the screws and make the tripod unstable. Additionally, ensure the legs are properly locked before transferring your eVscope 2 to the tripod.

**⚠ Warning:** the tripod cannot be used for any other purpose than holding your eVscope 2.

**Tripod's characteristics :**

Measurements : 59cm x 13cm (23,2 inches x 5,11 inches) - 125cm of heights max & 98cm wide open (49.2 inches x 38,5 inches)

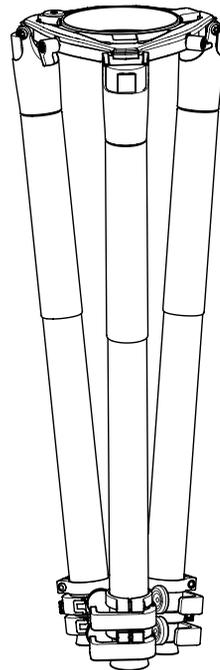
Weight : 2kg (4.4 lbs)

**Did You Know ?**

Cold environments can reduce the available battery capacity and shorten duration of use. While the eVscope 2 can function in temperatures down to -20°C (-4°F), we recommend you avoid using your eVscope 2 below 0°C (32°F) or above 40°C (104°F) to enhance the battery life.

**Did You Know ?**

We choose the color red to power on the device so it won't dazzle you at night.



## The backpack

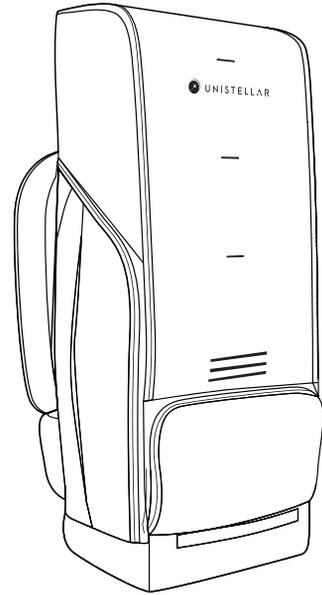
### What is the eVscope 2 Backpack?

The eVscope 2 backpack is constructed with tough, reinforced fabric and padded with high-density foam to protect your eVscope 2.

**⚠ Warning :** The backpack is not waterproof.

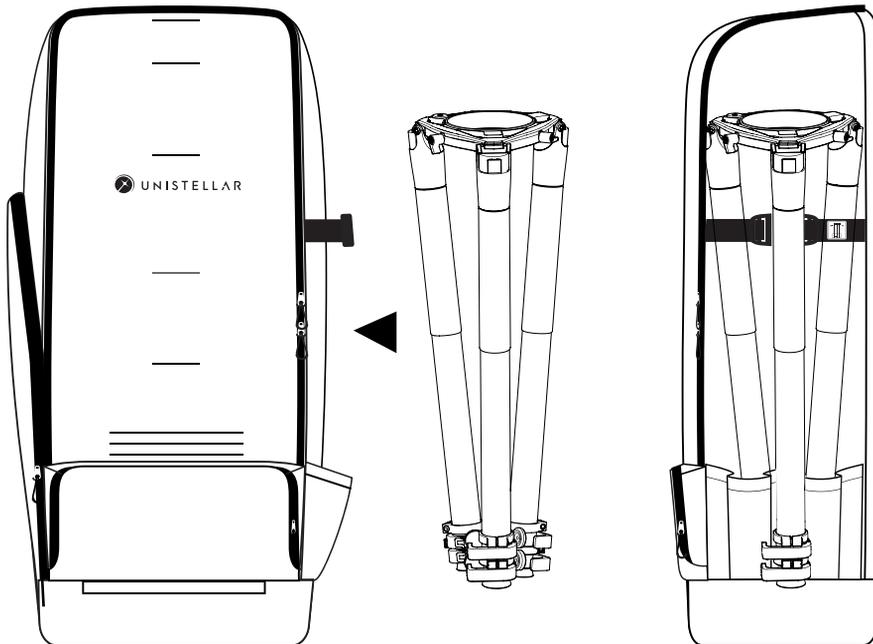
### Backpack's characteristics :

- Made out of robust materials as similar to leading camera or computer bags
- Built-in foam inserts match the shape of your telescope
- Internal strap securely fastens the instrument during transport
- Removable rain-shield (protects against rain and humidity) located underneath the backpack.
- Padded adjustable shoulder straps & hip-belt help to distribute the load weight
- 5 small internal pockets: 2 zipped, 2 to hold the telescope cap and eyepiece cover
- Ventilated back-panel
- 2 large external and 1 hip-belt zipped pockets



**Measurements :** 72 cm x 22.5 cm x 29 cm (H x W x D) - 28.3 inches x 8.6 inches x 11.4 inches

**Weight:** 2 kg (4.5 lbs.)



# 1 Download & install the Unistellar App



The App is your portal to the Unistellar experience and the community of users.

You will be able to:

- Discover recommended objects for you to explore with your eVscope 2
- Share your observations with other members of the community, and discover theirs
- Stay informed of all the latest space-related news and scientific discoveries
- Contribute to the scientific discoveries yourself by taking part in our observation missions

## ACTIVATE YOUR GPS BEFORE DOWNLOADING THE APP.

### Where to find the Unistellar App ?

On the Google® Play Store and the Apple® App Store (on smartphones or tablets) under the name Unistellar. The App enables you to wirelessly control your eVscope 2 with WiFi.



### Minimum requirements to download our App :

- Android 6 or iOS 12 operating system
- Touch screen
- WiFi
- 140Mo of available memory

*The App is not supported on FireOS devices. If you can't download it on your smartphone, check the operating system of your device. **Update the App when a new version is available in the the Apple® App Store (iPhone/iPad) or Google® Play Store (Android)***

If you experience difficulties downloading, installing or using the App, please contact our support platform at [help.unistellar.com](https://help.unistellar.com).

## 2 Your first deep-space exploration

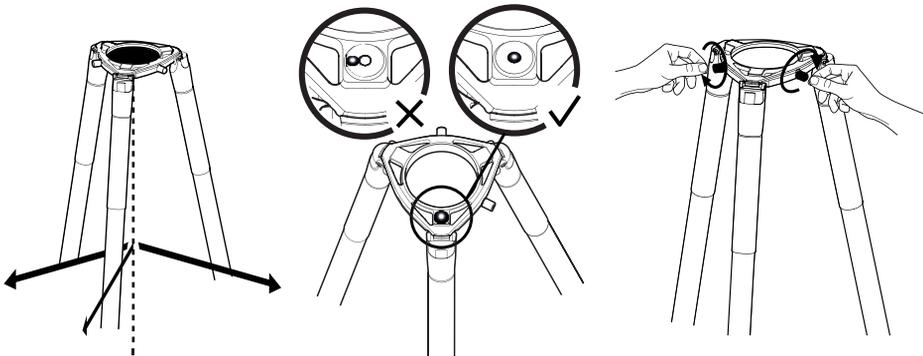
Follow this routine every time you set up your eVscope 2 to avoid any potential damage as breakage due to mishandling is not covered by warranty.



Scan this QR code to be redirected to a video on how to set up your eVscope 2

### 1 Set up and level the tripod

**⚠ Warning :** The tripod's legs screws could have loosened during shipment or regular use. Please check that all screws are tightened. If not, tighten them with the provided tool in the accessories box.



Open the legs of the tripod and adjust the height. Always setup your tripod on a solid surface.

Find the bubble level at the top of one of the tripod's three multi-angle leg locks (at the crown of the tripod). Adjust the legs to put the bubble level within the black circle.

Loosen the 2 tripod screws at the crown of the tripod.

Check that the tripod legs are properly secured.

**IMPORTANT : ALIGN AND RE-CENTER THE BUBBLE LEVEL EVERY TIME YOU MOVE YOUR EVSCOPE 2 TO ENSURE YOUR OBSERVATIONS ARE PRECISE AND ACCURATE.**

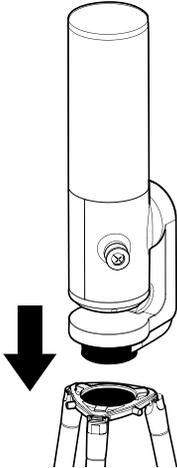
Tighten the tripod screws with the tools included in the box to avoid dropping the eVscope 2 as they can loosen over time.

## ② Install the eVscope 2 and power it on

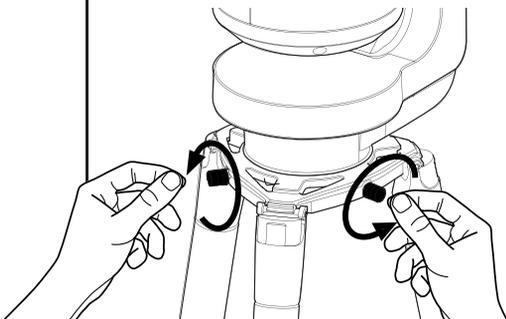
**A** - Pick up your eVscope 2, and cradle the tube and base in your arms and hands. Ensure the base of the eVscope 2 is fully supported, to avoid dropping the telescope during the installation process.

**B** - Install your eVscope 2 vertically on the tripod.

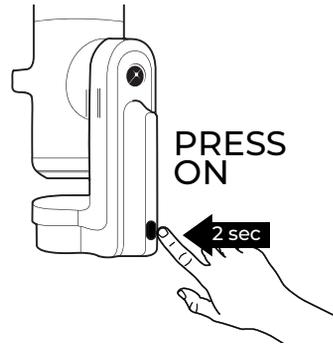
Ensure that the base is properly inserted into the crown of the tripod and fits in perfectly. **It should be stable, not loose nor wiggly.**



**C** - Tighten the screws at the crown of the tripod to secure your eVscope 2. Be careful not to tighten too hard as it may damage the thread.

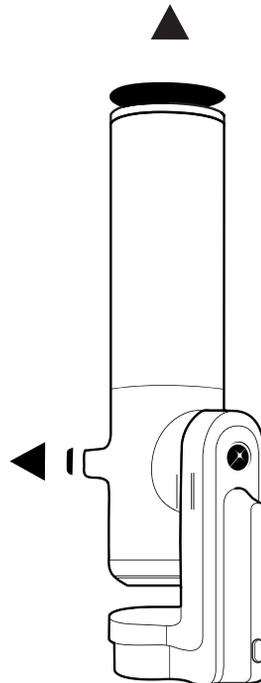


**D** - Start the eVscope 2 by pressing the ON button for 2 seconds. The LED is first purple then red.



*(You might not see the button light if you turn on your eVscope 2 in daylight because of its low intensity).*

**E** - Remove the cap covers on both the eVscope 2 tube and eyepiece.



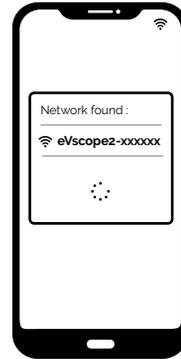
### ③ Connect your eVscope 2 to the Unistellar App, using WiFi

Launch the Unistellar App, and authorize the App to access your WiFi settings (or activate your WiFi on your device). The App will automatically detect your nearby eVscope 2.

Select your eVscope 2 from the list of network

You are connected to your eVscope 2

**If the App fails to detect your eVscope 2, check section 9 Troubleshooting.**



#### **Did You Know?**

The eVscope 2 creates its own WiFi network; it doesn't use your home/internet WiFi. No internet connection is required to operate your eVscope 2.

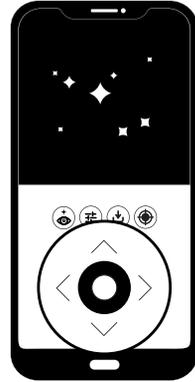


#### ④ Explore the night sky

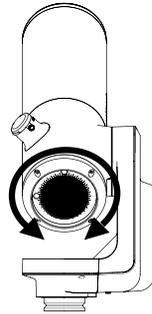
For best quality observations, the sky needs to be dark, with no-to-limited cloud cover, and multiple bright stars should be visible.

To move the telescope press and drag the dot of the joystick towards the arrows with your finger to point it in the direction you want. or, pinch-and-pull on your screen to zoom in on the image. Enjoy the live view ! You should be able to see stars through the eyepiece and on your screen.

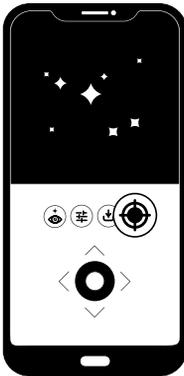
If what you see seems blurry, proceed with a fast focus (without using the Bahtinov mask) - **To learn how to get a high precision focus with the Bahtinov, check section 3 - Best practices for your observations - Focus adjustment.**



On your smartphone or tablet screen, adjust the focus of the eVscope 2 by turning the focus wheel located at the base of the eVscope 2 until the image is clear.



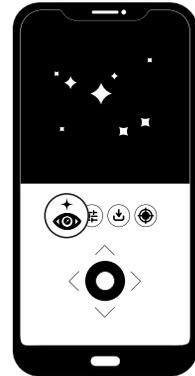
In the eyepiece, adjust the focus of the eyepiece's lens. Turn the control knob located next to the lens until you find the best setting for your vision.



Press the Autonomous Field Detection (AFD) button and the eVscope 2 will instantly recognize objects in its field of view.

Choose the **first recommended object in the catalog** of the App and hit the Go to button, it will take you directly to the object.

Once the telescope has reached its target, switch to Enhanced Vision mode to start revealing the details and colors of distant deep-sky objects. The longer you leave the Enhanced Vision active on an object, the more details will appear.



*If you want to look at the Moon and other closer and brighter objects such as planets, please see section **Observation of the Moon & planets** of this guide to get started.*

## 5 Park your eVscope 2

After each observation, use the Park function of your eVscope 2, accessible from the User > My eVscope menu. This will automatically move it to the **zenith** position and turn it off.

**If your eVscope 2 doesn't go perfectly into a vertical position when parked, it is normal.**

Replace your telescope cover and eyepiece cover before storing your eVscope 2 in its backpack.

If you run into challenges during this routine, please consult the troubleshooting section or visit [help.unistellar.com](http://help.unistellar.com).

## 3 Best practices for your observations

In this section we will explain a few recommended manipulations for any future observations.

### Thermalization

#### What is thermalization?

Thermalization refers to the process of equalizing the temperature between the components of your eVscope 2 and its external environment.

#### Why should I thermalize my eVscope 2 ?

The eVscope 2 performance will be optimized if the mirror reaches **thermal balance**. This step is very important to ensure that the mirror and the tube will not flex during use, resulting in potential changes in focus and image quality. Moreover, much like a hot road in the sun, differences in temperature can create a blur effect due to air displacement - this could affect the quality of your observations.

#### How to thermalize my eVscope 2 ?

If there is a difference in temperature between the outside and the room your eVscope 2 is stored in, turn on your eVscope 2 and put it outside about 15-30 minutes prior to your observation, depending on the temperature difference.

### Focus adjustment

#### What is the focus?

The focus refers to the distance between the mirror and the sensor, causing the light rays from the object to properly converge. If the rays converge after or before the sensor, the image will be blurry.

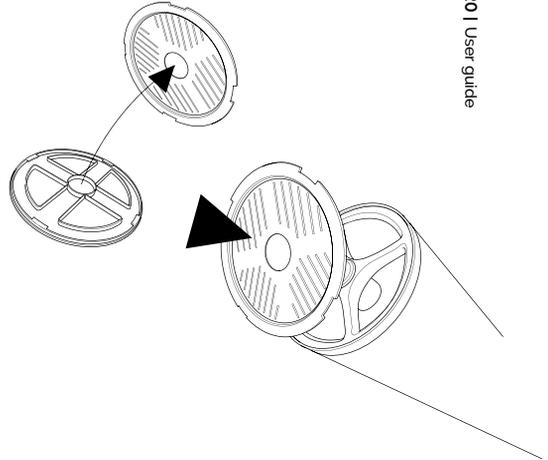
#### How often should I adjust the focus?

Adjust the focus before any observation including after leaving the eVscope 2 outside to thermalize. You might have to re-adjust your focus during long observation nights if the temperature has dropped dramatically or if other parameters of your observation have changed.

## How to get a high-precision focus using the Bahtinov mask ?

### Did You Know ?

The Bahtinov mask consists of three grills at three different angles. **It will create diffraction spikes for an accurate focus.**

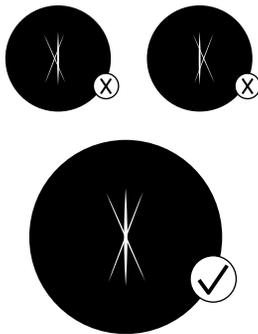


Go to the **first recommended star in the catalog** as it will be the brightest available to you.

Separate the Bahtinov mask from the cap cover. Place it on top of the eVscope 2 tube, and turn gently as needed to fit it onto the tube.

This will create a specific pattern forming an X, visible in the eyepiece and on your screen. Zoom in using pinch-and-pull on your device to clearly see the X.

Slowly rotate the focusing wheel until the central line is centered in the X.



### Quick TIP

it is usually too bright on default "auto" settings. Adjust those settings manually by toggling "auto" off.

**DO NOT ACTIVATE THE ENHANCED VISION MODE WHEN ADJUSTING THE FOCUS**



Scan this QR code to be redirected to our video on how to focus with the Bahtinov mask

## Dark frames

### What does a dark frame do ?

In digital photography taking a dark frame is the process of recording an image without signal and noise. Doing so improves your observations and the quality of the images you save. A dark frame allows the eVscope 2 on-board computer to analyze and correct any hot pixels or other image imperfections.

### Did You Know?

Noise can occur during a long exposure or with high temperature variations. You may see the effects of it with the emergence of hot pixels on your images (red, blue or green spots).

### How often should you take a dark frame ?

Dark frames can be taken at any frequency you like. As a minimum we recommend taking one in the winter and one in the summer (changes in temperature and altitude can create conditions for imperfections in images). A dark frame should also be taken prior to every scientific observation.

### How to take a dark frame?

**To take a dark frame, keep the cap cover on the eVscope 2 and make sure you are in dark surroundings. Don't expose the eVscope 2 to direct streetlight.**

Open the User > My eVscope section, select "Take Dark Frame".

If successful, the message "New Dark Frame Created" should pop up at the bottom of your smartphone screen. If an error message appears, try again later, possibly in a darker environment (there might be too much light detected on the image).



**Scan this QR code** to be redirected to our FAQ with more visual content on how to take a dark frame

## Collimation

If you are having difficulty achieving focus as outlined in previous sections, or if you are struggling to achieve a high-precision focus using your Bahtinov mask, your eVscope 2 may require collimation.

### What does collimation mean?

Collimation refers to the process of aligning the optical axis of the mirror (located at the bottom of the tube) and the sensor (located at the top of the tube). This is a different process than focusing your eVscope 2 and does not need to be completed as frequently.

### How often should I collimate my eVscope 2 ?

Collimation is required infrequently: mostly when you transport your eVscope with too much agitation for instance after transporting it in the trunk of a car.



**Check the collimation right after receiving your eVscope 2 for the first time.**

### How to collimate my eVscope 2 ?

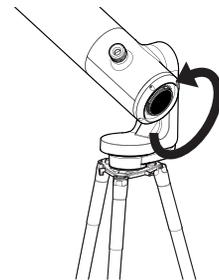
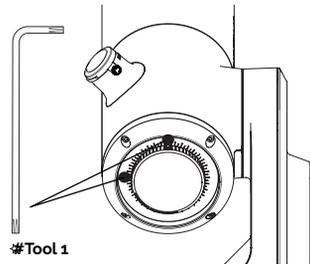
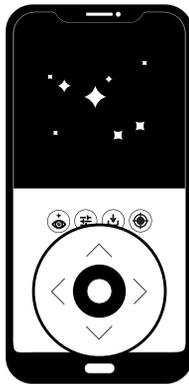
Collimate your eVscope 2 using the two screws located at the bottom of the tube. When you turn these screws, it adjusts the mirror position. The top screw will be used to move the star vertically and the left screw will be used to move the star horizontally.

For this procedure, you will need:

- 1 - The torx key (T20) provided in the toolbox,
- 2 - A clear sky with visible bright stars.

Point your eVscope 2 toward a bright star by selecting the first **recommended star in the catalog**.

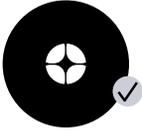
Center the target using the in-app joystick.



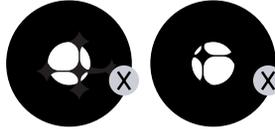
Defocus by turning the focus wheel counterclockwise to the maximum.



**Look directly through the eyepiece for this procedure.**



If the dark cross looks as shown here, your mirror alignment is correct

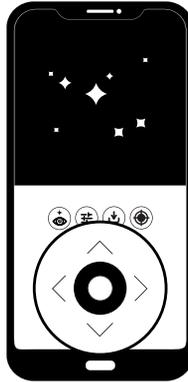


If the dark cross looks as shown here, you need to realign your mirror

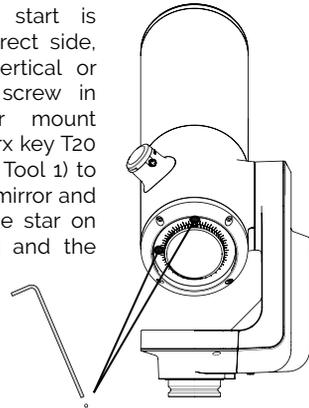


Take the torx key (T20) in the toolbox (Telescope Tool 1)

Move the telescope with the joystick using the arrows to put the star at the edge of your screen. Which edge? it all depends on your cross: if you see the off center cross on the right you will place the star on the right edge of the screen with the joystick, if the off center cross is on the left you will place the star on the left edge etc.



Once the star is on the correct side, turn the vertical or horizontal screw in the mirror mount with the torx key T20 (Telescope Tool 1) to adjust the mirror and recenter the star on the screen and the eyepiece.



**REPEAT THE PROCEDURE UNTIL THE CROSS LOOKS CENTERED. THIS MIGHT TAKE SEVERAL TRIES.**

Rotate the focusing wheel to align the visual cue.

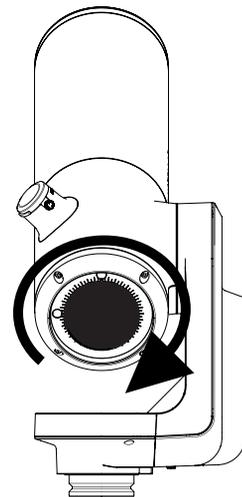
Move toward a target and enjoy the view.

**Quick TIP**

**Be careful with the screws. If you are a novice, take your time and go step by step.**



**Scan this QR code** to be redirected to our video on how to collimate your eVscope 2



## 4 Get the most out of your eVscope 2

### The powerful technology behind the eVscope 2

#### Catalog

Our catalog recommends **galaxies, nebulae, stars, and comets** based on your location and time. It has thousands of objects, including:

- The main planets
- The Moon
- 110 **Messier** Objects
- 2500 New General Catalog targets (NGC)
- Comets
- Thousands of small **solar-system** bodies including main-belt asteroids, Jupiter, **Trojans, and dwarf planets** ( $V \leq 15,5$ )

Source : NED - NASA/IPAC Extragalactic Database [ned.ipac.caltech.edu](http://ned.ipac.caltech.edu)

You can point at targets not yet in the catalog by entering the desired coordinates in the Alt/Az or Ra/Dec button in the Explore tab of the App.



Objects like the Veil Nebula are difficult to observe and require darker skies to be visible. For beginner users, start with the brightest object like M51 or NGC 891.



#### Autonomous Field Detection

##### What is AFD ?

Autonomous Field Detection (AFD) is an algorithm that uses an internal map with tens of millions of star coordinates to accurately identify any object in the eVscope 2 field of view.

##### What does the AFD do?

The AFD points at objects in the night sky automatically, making it easier to find targets. It also provides information about what you're observing, like distance from the Earth, size, age, etc.



To activate the AFD, you need to have a clear and dark sky, as well as a decent focus. A bright moon can inhibit the eVscope 2 ability to recognize stars.



## Enhanced Vision

### What is Enhanced Vision ?

Enhanced Vision is a system that uses its low-light sensor to accumulate light continuously through the live accumulation (stacking) of a series of short exposure frames. Enhanced Vision improves the objects you see with time.

Depending on observing conditions (light pollution, moon phase, weather, etc.) and the objects you are pointing at, it can take a few seconds to a few minutes to see their colors and shapes using Enhanced Vision while using.

### Software

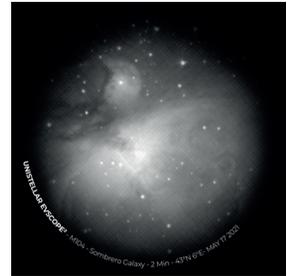
The eVscope 2 software uses its on-board computer to stack and process frames (dark and background removal, shift adding and stacking). It produces an improved image and projects it in real time with a derivation algorithm that compensates for the earth movement / rotation. This allows long exposures of objects the user is viewing.

### Did You Know ?

The eVscope stacks images every 4 seconds

## Image Overlay

You can save images with or without an overlay by selecting your preference in the Settings of the User tab. The overlay shows the name of the object, coordinates, date and time.



### Gain

#### What does the gain do ?

Gain electronically increases the signal in Live View mode. The lower the gain, the better your images ; the higher the gain, the brighter the image. When you increase the gain, you also increase the noise: you will see fainter objects, but they will be more noisy.

### Exposure Time

#### What is exposure time ?

Exposure time is the length of time the sensor is exposed to light (between 1ms and 4s for a single exposure in Enhanced Vision mode).

### Magnification

#### What does magnification do ?

Magnification is fixed at 50x but can be increased it up to 8x. You can therefore zoom up to 400x max.

#### How to change the magnification ?

A double tap on your screen will zoom to 150x. You can adjust it by sliding two fingers on your screen. Saving an image, in Live View or Enhanced Vision while the zoom is applied will not save the zoomed image, it will save the original one.

## Observation of the Moon & planets

You can observe the Moon and planets, like Jupiter and Saturn, but they are very bright. They can't be seen better than with a classical telescope, except for Neptune and Uranus which are very far and fainter.

Use the Go to button to point the eVscope 2 at the **celestial** object. Gain (dB) and exposure time (ms) will be automatically adjusted in order to view the Moon or planets.

### Did You Know?

The eVscope 2 was primarily created to observe the deep-sky wonders of the Universe

### Observing the Moon :

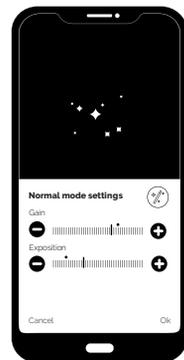
Because of its brightness and proximity, a "Go to Moon" may not center the Moon exactly in the eVscope 2 field of view.

Follow these simple steps to get the best Moon observation:

After the Go to Moon, open the live view settings and make sure Gain (dB) and Exposure Time (ms) are not set on «auto».

Gently reduce the Gain (dB) by dragging the control button to the left.

When your screen is almost dark, press the settings icon and with the joystick move the telescope in direction of the light source.



**REPEAT THIS OPERATION AS NECESSARY UNTIL THE MOON COMES INTO FULL VIEW OF THE EVSCOPE 2.**

### Observing planets :

Most planets are too bright to use Enhanced Vision, and should be observed using Live View mode.

After the Go to is validated on Venus, Mars, Jupiter or Saturn, the eVscope 2 will automatically switch to planet mode, adjusting its image parameters to the brightness of the object.



The planet mode sets the gain at 0 to avoid saturation. You can adjust images with our suggested values:

	Planet		Satellites	
	Gain (dB)	Exposure (ms)	Gain (dB)	Exposure (ms)
<b>Moon</b>	0	5-20		
<b>Venus</b>	0	0.3 -10		
<b>Mars</b>	5	5 - 30		
<b>Saturn</b>	5	10 - 30	25	100
<b>Jupiter</b>	5	5 - 20	25	100

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## GPS and Localization

You can use the eVscope 2 on a balcony or in a garden, in the city or in the country. We recommend at least 45 degrees of open sky.

Different factors come into play based on your location which can affect the quality of observations, for example: quality of the night sky, position in the **Bortle scale**, light pollution, atmospheric interference, altitude, and position compared to the equator.



Scan this QR code to be redirected to our video on how to observe a target which is not in the catalog of objects



Define your portion of open sky in the App to have the catalog suggest only objects in your visibility area.

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## Light Pollution

Your eVscope 2 can be used in highly light-polluted areas, and yet you will still be amazed by the quality of your observations and what is visible in the night sky.

To reduce the impact of light pollution, stay away from street lights (go behind a building or trees), building and security lights, or other direct light sources that may be shining toward you. This will enable you to enjoy objects like the Dumbbell Nebula, Ring Nebula or Whirlpool Galaxy.

### Did You Know?

The eVscope 2 uses a proprietary combination of product design, hardware and software to filter through light pollution.

## Weather and Temperatures

You will not be able to observe if you are under a cloudy sky. The eVscope 2 is highly sensitive to wind as it creates vibration and can make the Enhanced Vision drop.

We recommend the following temperature range for your eVscope 2 :

- Storage : 10°C (50°F) to 40°C (104°F)
- Observation and recharge : 10 °C (50 °F) to 40 °C (104 °F)
- Observation : 0 °C (14 °F) to 40 °C (104 °F)



Cover your eVscope 2 when using it in a very cold environment, to provide relative insulation.

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## 5 Data

### Why should I share my data with Unistellar ?

#### HELP IMPROVE THE OBSERVATION EXPERIENCE AND PARTICIPATE IN SCIENCE (ACTIVELY OR PASSIVELY)

First of all, sharing your data is not mandatory for your observations - we do not access it if you do not choose to share it with us.

The data collected by the eVscope 2 at each observation is stored in its memory and includes raw data (frames) of the objects observed in Enhanced Vision or during Science Missions, as well as metadata (geolocations, timestamps).

All the data collected by our users is gathered in our secure database and allows us to continually improve the observing experience of our users.

By sharing your data, you can also help us make scientific discoveries.

Find out more about our science programs, both active and passive, on our website.

#### Things to know about the data storage :

The SD card has a capacity of 64GB. Do not switch to a different SD card.

Uploading your data on a regular basis will free up some storage space. Your eVscope 2 can upload at a speed of 6Mo/s on a 2.4Ghz network and 8Mo/s on a 5Ghz network. If you need to upload 12Go, it will take at least 30 minutes.

Images of your observations are saved on your smartphone. You can still save pictures in the gallery with a full memory (100% data storage used). The eVscope 2 will continue to operate normally but you won't be able to take part in community events or citizen science campaigns.



**Start your data upload after each night of observation - the eVscope 2 will shut down once the transfer is completed.**

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#### How to upload ?

When your smartphone is connected to your eVscope 2, open the Unistellar App's "User" tab and navigate to "my eVscope".

Tap on the "Upload data" button (it will be grayed out if there is no data stored).

Enter your "WiFi information" (your home WiFi network or your phone hotspot). Enter the SSID (the name of your network) and enter your password. **It is case sensitive.**

**PAY EXTRA ATTENTION WHEN ENTERING THIS ITEM: 8 TIMES OUT OF 10, THE UPLOAD FAILS BECAUSE OF A TYPO IN ONE OF THESE TWO SETTINGS.**

Click on "Submit" and the eVscope 2 LED will turn from red to a blinking bright yellow (the eVscope 2 is trying to connect to the selected network).

Your device will no longer be connected to the eVscope 2 and information like the name or storage usage won't be accessible in the app. The LED will blink in a regular pattern.

Once connected to the selected network, the LED will either :

- Turn green and blink rapidly between 1 and 6 times and stay solid green for 1 minute if the upload succeeds.

- Turn solid orange during 1 minute which means an error has occurred. **In this case see section 9 - Troubleshooting of the user guide.**

Once the transfer is complete, reconnect your phone to the eVscope 2 and go back to the User tab in the App. You should see "Storage: 1% used". The remaining 1% is used for dark frames and for internal files necessary for the operation of the eVscope 2.

### **Did You Know?**

The number of blinks indicates how much data there is to transfer, the higher the number of blinks the more data there is to upload.

We are working on making RAW images accessible for post processing. **Subscribe to our newsletter to stay informed: [unistellarooptics.com](http://unistellarooptics.com)**

There is no USB or Ethernet port to read images. Images can be saved and shared on the smartphone connected to the eVscope 2. They are in PNG format.



**Scan this QR code** to be redirected to our FAQ with more visual content including a video on how to upload your data

## 6 Contribute Actively to Science

### The SETI Institute

In July 2017, the SETI Institute and Unistellar partnered to develop scientific applications for the eVscope 2 network as it can play a major role in a wide range of research topics linked to **planetary defense, exoplanets, occultations**, and the study of many **transient astronomical events**.

#### Did You Know?

The SETI Institute is dedicated to scientific research, education, and public outreach. Its mission is to explore, understand, and explain the origin and nature of life in the universe, and to apply the knowledge gained to inspire and guide present and future generations.

### Scientific Campaigns

Sign up for our Citizen Science emails or join our Slack group to exchange in dialogue with our community about scientific observations. To receive your invitation link for Slack, contact us at [citizenscience@unistellaroptycs.com](mailto:citizenscience@unistellaroptycs.com)

You will soon become a citizen astronomer and contribute to scientific discoveries.

### Planetary Defense

Our planet is not out of danger. Our solar system is home to other celestial bodies such as asteroids or artificial objects. Sometimes, asteroids cross the orbit of the Earth: Among these **Near-Earth Asteroids**, some are identified as "Potentially Hazardous Asteroids," which could collide with Earth. The Planetary Defense program aims to find, track and characterize these near-Earth objects (NEOs) in our solar system. Unistellar scientists provide different targets to observe with your eVscope 2 every month.

To protect our planet, learn more here : [unistellaroptycs.com/citizen-science/planetary-defense](http://unistellaroptycs.com/citizen-science/planetary-defense)

### Asteroid Occultation

Detecting an asteroid's occultation entails observing an asteroid passing between a bright star and your position on Earth. The blinking of the star recorded by the eVscope 2 provides valuable data so astronomers can learn more about the trajectory, size, shape and composition of an asteroid.

Scientists who launch an observing campaign invite eVscope 2 users to join their research by activating their device's "Occultation Mode." Watch it with your eVscope 2, send these data to scientists, and make the world more informed and aware of asteroids. You will receive results about your occultation afterwards.

Wherever you live in the world, it's very likely that there will be an occultation for you to observe.

To observe an asteroid occultation, learn more here: [unistellaroptycs.com/citizen-science/asteroid-occultations](http://unistellaroptycs.com/citizen-science/asteroid-occultations)

## Exoplanet Transit

### Why observe them ?

For science; in the 90's two scientists detected the first exoplanet, since then, thousands of planets have been detected, orbiting around stars, we also came to realize that each star/planet system does not necessarily have the same configuration as our solar system. Moreover, observing exoplanets will perhaps allow us one day to discover another form of life or a planet similar to Earth.

The easiest technique to observe them is the transit method: observe a bright star when the exoplanet passes between the star and your position on Earth.

Unistellar scientists are providing a list of targets to observe with your eVscope 2 every month.

We have identified several scientific areas where the Unistellar/SETI network can make important contributions to scientific research:

- Repetitive and coordinated observations of short period Jupiter-sized exoplanets to accurately measure their size and orbit shortly after their discovery.
- Coordinated observations of transits to confirm their existence and inspect the areas surrounding these exoplanets to infer the presence of other objects (disks, other planets, large moons).

**To discover new exoplanets, learn more here:**

***[unistellaroaptics.com/citizen-science/exoplanets](http://unistellaroaptics.com/citizen-science/exoplanets)***

## 7 Share your observations

### Sharing with a crowd

Up to 10 people can gather around the eVscope 2 using their smartphones or tablets, including you. Only the "Operator" can operate on the eVscope 2. Others will be considered as "Watchers" and will not be able to control the eVscope 2. You can request to become the Operator in the user tab of the App.

### Remotely sharing your observations

Your smartphone needs to be connected to your eVscope 2 via WiFi ; you can use your cellular connection (3G/4G/5G) to stream on the Internet at the same time. You can also plug your smartphone to your computer to share your smartphone's screen on it and to use its WiFi connection to stream.



**Use Apps like Zoom or Skype to share the screen with Unistellar community.**



**Scan this QR code** to be redirected to our FAQ with more visual content including a video on how to stream your Unistellar app on Internet

## 8 Storage and maintenance

### Maintenance and storage of the eVscope 2

Store the eVscope 2 in the original packaging or in its backpack.

Store the eVscope 2 with the cap cover and the eyepiece cover on, to prevent dust from entering the device.

Do not store the eVscope 2 with an empty battery.

Do not store the eVscope 2 in a wet or highly humid environment.

Do not store the eVscope 2 at temperatures below 10°C (50°F) or above 40°C (104°F).

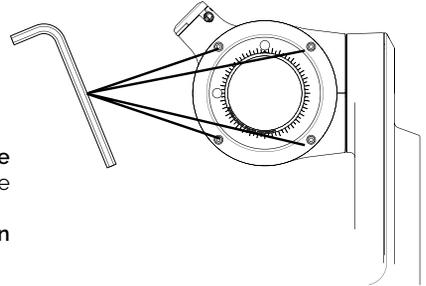
Do not store under direct sunlight.

### Maintenance of the mirror

The mirror can be removed by unfastening the 4 screws on the back of the adjustment mechanism.

**Gloves must be used in order to manipulate the mirror.** Once the system is removed the mirror can be cleaned with dry compressed air.

**No liquids nor wet tissues should be used to clean the mirror.**



### Maintenance and storage of the tripod

Tripod screws can become loose with usage. Please check the clamps before any use.

Three different tripod tools are provided in order to tighten the screws of the tripod.

Do not store the tripod under direct sunlight.

Do not store the tripod in a wet or highly humid environment.

### Maintenance of the battery

The battery is not meant to be removed by the user.

To maximize battery life, you should avoid high discharge while using your eVscope 2.

Avoid using your eVscope 2 at low temperature  $\leq 0^{\circ}\text{C}$  or high temperature  $\geq 40^{\circ}\text{C}$  (104°F), as this can affect the Lithium-ion battery.

A very cold environment can increase the consumption of your battery. It will result in a shorter duration of use.

### Travelling with the eVscope 2

If you need to travel on a plane, do not put your eVscope 2 in the backpack as a checked luggage; it might be damaged and it won't be covered by the warranty. Use a rigid case to make sure your eVscope 2 stays perfectly safe.

**Quick TIP:** Expert users recommend hard cases for travel purposes.

The eVscope 2 weighs 7 kg, (19.8 lbs), the tripod 2 kg (4.4 lbs) and our backpack is 2kg (4.4 lbs).

**IMPORTANT : THE BACKPACK IS TOO LARGE TO BE AUTHORIZED AS A CARRY-ON WITH MOST AIRLINES.**

Lithium-ion batteries under 100 W are allowed in checked bags as part of the device.

### Warranty

The eVscope 2 comes with a 2-year warranty worldwide.

The warranty does not cover damages caused by dropping your telescope, even accidentally.

If you have damaged your eVscope 2 or need spare parts, contact us at :

[support@unistellaroptycs.com](mailto:support@unistellaroptycs.com)

## 9 Troubleshooting

**Unable to connect to the App :** If you see the mention "**You are not connected**", check if you are connected to the eVscope 2. Check that your WiFi is active on your device and that the eVscope is turned on and within reach (ideally within 5 meters) of your device. You can also manually connect to your eVscope 2 by selecting "eVscope2-xxxxxxx" in the available WiFi networks. If the problem persists, reinstall the App.

**The Go to is grey or doesn't center the object on the screen :** This can happen if the object is really far from the eVscope 2 or if the object is close to the zenith. Recenter the object with the joystick or press the AFD on another part of the sky. If the problem persists, we recommend you reinstall the App.

**The Enhanced Vision stopped or dropped :** you can get one of these messages:

- "**Important shock detected – Please check level and re-align**". An important shock is detected (a kick on the tripod). Re-adjust your level bubble and go through the focus & track procedure as explained in the Quick Start Guide.
- "**Too close to zenith – Please re-align at a lower altitude**". The eVscope 2 is getting near the zenith. Go through the focus & track procedure.
- "**Your eVscope is stopping the Enhanced Vision. Do you want to save the image?**" The object disappeared behind an obstacle (tree / house).

While you observe, you might see "**Enhanced Vision dropped**". One of the images stacked by your eVscope 2 has an issue and is skipped to maintain the quality of your observation.

Two specific messages can appear:

- "**Enhanced Vision dropped. Vibration detected**" : A minor shock has been detected (someone bumped against the eyepiece or the result of wind).
- "**Enhanced Vision dropped. Too bright**": An image has been polluted by light (someone turned on his/her smartphone's flashlight).

**Fail to upload :** The amount of devices allowed on a network can cause this or the MAC address filtering in place. Connect to your home WiFi network with another device to enable more devices or add the eVscope 2 MAC address to the list. This can also be an issue if you are trying to upload from a secure network with multi-factor authentication, like a university or a government office. It can also fail due to WiFi channel incompatibility, restarting your router / device WiFi connection will solve the issue.

**WiFi drop :** The WiFi can drop for different reasons:

- The distance between you and the eVscope 2
- The wall thickness between the user and the eVscope 2
- The auto-lock
- Your OS that has WiFi preferences
- A communication error between the eVscope & the phone

There is no way to boost the WiFi signal of the eVscope 2. Try using an extender with the same SSID as the eVscope 2 to extend the range.

If you experience connectivity issues, turn off the "auto-connect" options on the other known networks.

**Issue with the focus :** If you do not see the diffraction pattern (the star symbol), manually adjust the exposure time and gain using the Bahtinov mask.

**Can't take a dark frame :** Try again in darker surroundings and make sure your telescope was left outside for 15 minutes. Don't forget to use the cap cover.

#### **EXTERNAL RESOURCES**

**Sky map:** [stellarium-web.org](http://stellarium-web.org)

**Light pollution map:** [lightpollutionmap.info](http://lightpollutionmap.info)



## 10 Let's keep in touch

### Need help ?



Website : [unistellar.com](http://unistellar.com) (scan this QR code)  
Contact support : [support@unistellaroptycs.com](mailto:support@unistellaroptycs.com)  
FAQ : [help.unistellar.com](http://help.unistellar.com)

 [@unistellar](https://www.facebook.com/unistellar)

 [@unistellar](https://twitter.com/unistellar)

 [@unistellarscope](https://www.youtube.com/unistellarscope)

 [@unistellarscope](https://www.instagram.com/unistellarscope)

# ● Need help ?

## Glossary

**A Altazimuth mount** : Two-axis mount for supporting and rotating an instrument about a vertical and a horizontal axis.

**Asteroid** : A small body made of rocks and metals with a size varying between cm and km. Asteroids are the result of fragments of rocks that do not have to be agglomerated for an ancient planet due to Jupiter's influence and have an orbit around stars.

**B Barlow lens** : Modern Barlow lenses are used in astronomy and astrophotography as optical elements to increase the magnification of a telescope.

**Bahtinov mask** : Device that facilitates the development of astronomical instruments. It was named after its inventor Pavel Bahtinov.

**Bortle scale** : Defines the sky brightness using 9 classes and quantifies the astronomical observability of celestial objects and the interference caused by light pollution (1 : very dark & 9 : very bright).

**Celestial** : Positioned in or relating to the sky, or outer space as observed in astronomy.

**Collimation** : The process of aligning the optical axis of the mirror.

**Comet** : Loosely packed balls of ice made out of gases, dust and rock that orbit the Sun.

**Constellation** : Group of apparent stars forming a recognizable shape.

**D Diffraction** : Light diffraction is a physical phenomenon by which ray lights from a point source are deflected at the edge of a non transparent object.

**Dwarf planets** : Astronomical astre orbiting around a sun which is not a moon. It has sufficient mass so that its internal pressure outweighs the cohesive forces of the solid body and maintains it in hydrostatic equilibrium (in an almost spherical form).

**E Exoplanet** : Planet located outside the solar system.

**G Galaxy** : Set of stars, dust, interstellar gas and dark matter whose cohesion is ensured by gravity.

**L Light year** : Astronomical units corresponding to the distance (and not the duration) traveled by the light in one year (9 461 billion km).

**M Magnitude** : Measure of the brightness of a star as it appears from Earth.

**Messier's objects** : The Catalog of Nebulae and Star Clusters, better known as the Messier Catalog, is an astronomical catalog of 110 objects (with a diffuse shape) created in 1774 by Charles Messier. It lists the most beautiful deep sky objects accessible with the instruments of amateur astronomers. The Messier catalog numbers, noted M1 to M110, continue to be used for these objects, although other names are also widely used.

**N Near Earth Asteroid** : Asteroid whose orbit intersects that of the earth.

**Nebulae** : gas and dust clusters formed by star explosion residue.

**Newtonian telescope** : Optical device with 2 mirrors with a "reflective" lens (reflects light).

**O** **Occultations** : Phenomenon by which a star (planet, moon, star, asteroid) is totally or partially masked by another star which passes between it and the observer.

**S** **Solar-system** : The planetary system to which the Earth belongs. It is made up of stars, the Sun, and celestial objects orbiting around it: 8 planets and their 205 known natural satellites, the five dwarf planets we know and their natural satellites, and billions of small bodies (such as asteroids, comets, interplanetary dust, etc.).

**Star** : Celestial body which radiates its own light by nuclear fusion reactions or bodies which have been in this state at some stage in their life cycle.

**Supernova** : Cataclysmic event signing the end of a star. A supernova can result from two very different types of events: the thermonuclear explosion of a white dwarf following accretion of material from a neighboring star or the gravitational collapse of a massive star (a so-called core-collapse supernova).

**T** **Thermal balance** : A system is said to be in thermal equilibrium with itself if the temperature inside the system is spatially uniform and temporally constant. In our case, that means the telescope has to be at the same temperature as the environment.

**Transient astronomical events** : Phenomenon involving a celestial object whose duration can range from a few seconds to a few days, weeks or even years.

**Trojans** : On Jupiter's orbits, between 160,000–240,000 asteroids called Trojans are distributed in two elongated, curved regions at the stable point named Lagrangian points.

**Z** **Zenith** : The zenith is an imaginary point directly "above" a particular location, on the imaginary celestial sphere.



## Safety instructions

Everything you need to know about the telescope

	Your eVscope 2 and its accessories are not toys. Do not allow small children to play with them because children could hurt themselves or others or damage your device. Keep your device and all its parts and accessories out of the reach of small children.
	Your eVscope 2 is not meant to be used in a wet environment. As with every electronics object (with the exception of the waterproof ones), if water or another liquid enters the eVscope 2 it can be permanently damaged. You should immediately turn off the power and dry it.
	Do not look at the Sun without an adapted filter. Your eVscope 2 can be definitively damaged also after a short exposure. There is also an important fire hazard. Furthermore, do not expose your eVscope 2 at temperatures above 40°C or below 10°C, the performances can be compromised by extreme temperatures.
	Your eVscope 2 is fragile, do not let it drop or fall. In case of shocks, it can be permanently damaged.

## Specifications

**Model:** eVscope 2

**Mirror specifications:** diameter 114mm, focal length 450mm, material BK7

**Battery specifications:** Lithium-ion: (6 x 18650), 9 hours life (normal use @20°C), capacity 15 000mAh (55.5 Wh)

**Power supply unit (PSU) input:** 100-240V ~50/60 Hz 0.6A Max; Output: 5.0Vdc, 2.4A

**WiFi frequency and bandwidth:** 2.4 GHz, 72.2 Mbit/s

**WiFi range:** 50m in free space

**Input/output:** USB-C (PSU); USB-A (smartphone recharge)

**Tripod:** aluminum, adjustable height; designed for the eVscope

## Declarations

Hereby, Unistellar SAS declares that the radio equipment type eVscope 2 is in compliance with Directive 2014/53/EU, the FCC 47 CFR Part 15 and the ICES-003 / NMB-003 standards. The full text of the declarations of conformity is available at the following internet address: [unistellar.com](http://unistellar.com).

**Contains: FCC ID: 2ABCB - RPI3BP. Contains IC: 20953-RPI3P**

**For Canadian users:** A separation distance of 20cm or more is required between the user and the device according to Canadian standard RSS-102 — Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

(<https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01904.html>)

当該機器には電波法に基づく、技術基準適合証明等を受けた特定無線設備を装着している

To satisfy RF exposure requirements, a separation distance of 20 cm or more should be maintained between this device and persons during device operation.

To ensure compliance, operations at closer than this distance is not recommended. The antenna used for this transmitter must not be co-located in conjunction with any other antenna or transmitter



**The eVscope 2 is recommended to set up on the tripod along with the telescope only. It can't be set up on any other brand tripod, otherwise the action will bring unexpected damage or hurt somebody.**

## Recycling



This device is compliant to the 2012/19/UE directive and should not be disposed of in household waste. The special waste disposal varies according to local rules. The correct recycling of electronic devices helps to preserve the environment and health.



Type of product : Telescope  
Type designation : eVscope 2  
Brand Name : Unistellar  
Ratings : 5Vdc, 2,4A, Class III

v1.1.4

**Unistellar SAS**

19 rue Vacon  
13001, Marseille France  
N° SIRET 81233935600022  
Designed in France – Made in China

