OCAL H-2 Astrograph

User manual

Version 1.8 – 29.08.2025

Thank you for purchasing the OCAL H-2 Astrograph. This product combines several innovative technologies. To guarantee you the best possible experience, please read these instructions carefully before use. Up-to-date information can be found on page 19 in the chapter Imprint and Support

- Subject to change without notice -

Important notes and warnings

- Never point the telescope towards the sun!
- Every OCAL H-2 Astrograph is checked by noctutec before delivery. After successful testing, each OCAL H-2 Astrograph receives a noctutec test seal. The seals are used to distinguish our OCAL H-2 from any gray imports.

  Please do not remove the seal!

  We only accept service and warranty claims on presentation of the original invoice and an existing seal of approval!

- Micro-scratches and pits in optical surfaces and coatings are unavoidable in the manufacture of precision optics. They have no effect on the image quality and do not constitute a defect.
- As with all reflector telescopes, the mirrors must not be touched!
- Avoid touching the anti-reflective coating on the inside of the tube. The inside of the tube can be cleaned with purified compressed air if necessary.
- The focuser must not be operated by hand when a focus motor is attached, as this may damage the focus motor or the focuser (see chapter 4.3).
- The heating can lead to a slight deformation of the mirror. Therefore, the default power in automatic mode is limited to only 3% of the maximum, which raises the mirror temperature slightly above the dew point without overheating. Avoid setting too high a power manually, as this can lead to temporary deformation of the mirrors, resulting in a reduction in image quality. If a reduction in imaging performance is noticeable even at 3%, reduce the power further or switch off the device by disconnecting it from the power supply (see chapter 5.1).
- The inspection window must remain closed during exposure so that the anti-dew system can work properly and to prevent light from entering (see chapter 6.2).
- Although the markings on the mirrors are insoluble in water, they are not resistant to alcohol or organic solvents (see chapter 7.1).
- The central screw of the secondary mirror cell must not be loosened too far, otherwise there is a risk of the secondary mirror falling into the tube (see chapter 7.2.1)

Table of Contents

1 Product Presentation

The OCAL H-2 Astrograph is a hyperbolic Newtonian reflector telescope that has been specially developed for astrophotography. The diameter of the primary mirror of the H-206 model is 206mm with a focal length of 560mm. The extremely fast optics with a focal ratio of f/ 2.72 ensures that even faint large-area objects are exposed in a short time.

In order to achieve this aperture ratio, we have undertaken many complex optical and mechanical designs. These include

- a carefully crafted optical system
- Strict controls with professional optical devices such as interferometers and centering instruments
- the construction of a mechanical positioning structure for the primary mirror
- a precise fine adjustment device for the secondary mirror
- a completely redesigned focuser
- Micro-heating to prevent dew condensation on the optical system
- the coating on the inside of the tube with noctutec SL-94 anti-reflective paint, an open-pored coating with a nanostructure that effectively suppresses incident scattered light across the entire light spectrum. This is a significant advantage over velours, which clearly reflects in the red part of the spectrum.

These design features ensure that the OCAL H-2 can fully develop its outstanding optical performance.

2 Scope of Delivery

- Complete optical tube (OTA), including tube rings, Losmandy type dovetail bar, focuser, coma corrector and other components
- OCAL anti-dew system.
- M48 and M54 adapters
- A set of screwdrivers and Allen keys for collimationg the telescope
- USB cable and power cable
- Flightcase with wheels

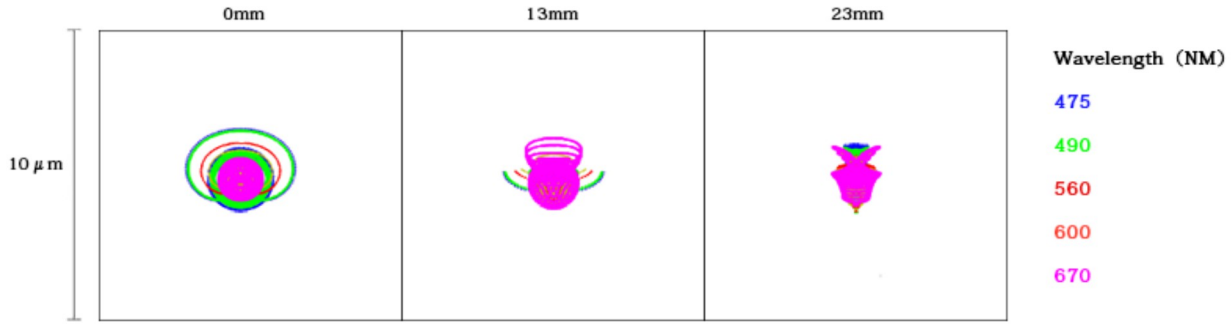
3 Product Parameters

3.1 Technical Data

Model	OCAL H-206
Primary mirror	206mm diameter, hyperbolic, with markings
Focal length	approx. 560mm
Opening ratio	f/ 2,72
Secondary mirror	80mm diameter large axis, flat, with markings
Corrected image field	44mm / full frame
Substrate primary and secondary mirrors	Fused silica glas
Proofreader	4-element apochromatic corrector with one super ED lens
Working distance to the corrector	55mm
Focuser	Completely newly developed 8-fold ball bearing mounted 2.5" rack and pinion drive with coarse and fine movement. A tilt device is integrated in the base. The corrector is screwed into the focuser. The focuser has an integrated ball-bearing rotator (CAA) with graduation.
Telescope tube	Length 630mm, Diameter: 254mm
Telescope tube material	4mm Carbon fiber

Anti-reflective coating	noctutec SL-94 Anti-reflective paint
Dew prevention	Intintegrated automatic OCAL anti-dew system for primary and secondary mirrors (Dew Prevention Box). Pre-programmed or controllable via software (Windows)
Mirror cell	completely newly developed and very elaborately designed, CNC-milled mirror cell
Other	Cleaning and inspection window at the back of the tube
Tube rings	CNC milled from aluminium, 10mm thick, 22mm wide, Inner diameter 254mm, each with 6 flat surfaces with M6 threads for attaching accessories
Dovetail bar	Highly robust CNC-milled dovetail bar (Losmandy style)
Carrying handle	CNC-milled from aluminium with several mounting options for accessories
Weight	12.7kg with attached CNC tube rings
Transport case	Robust flight case with wheels and telescopic handle
Visual observation	Not intended for visual observation!

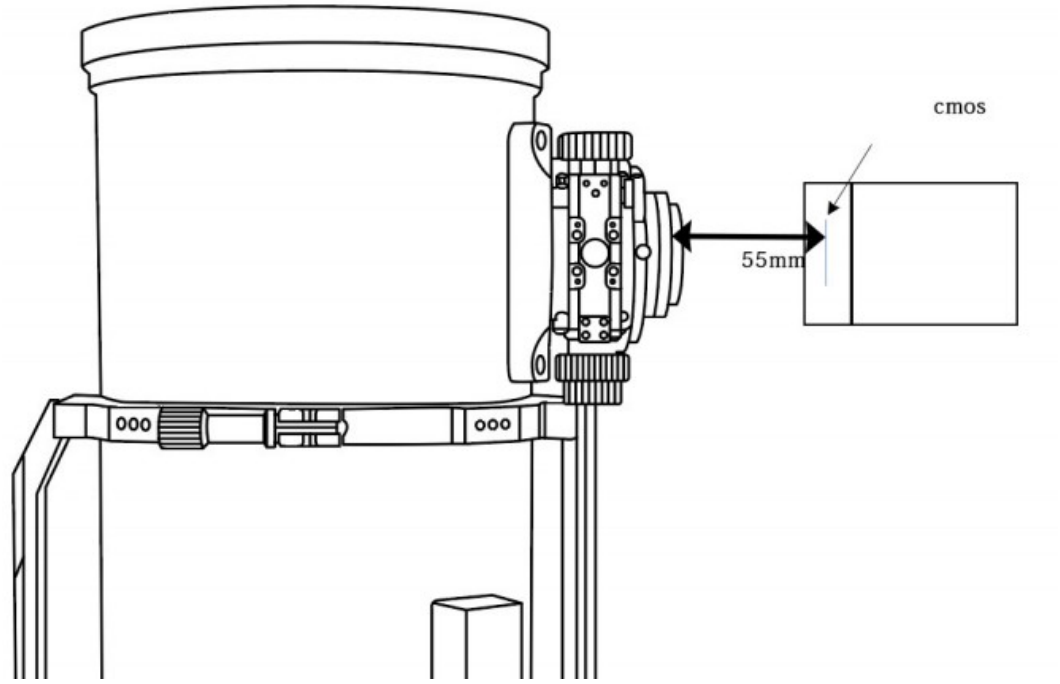
3.2 Spot Diagram



4 Assembly Instructions for the Telescope

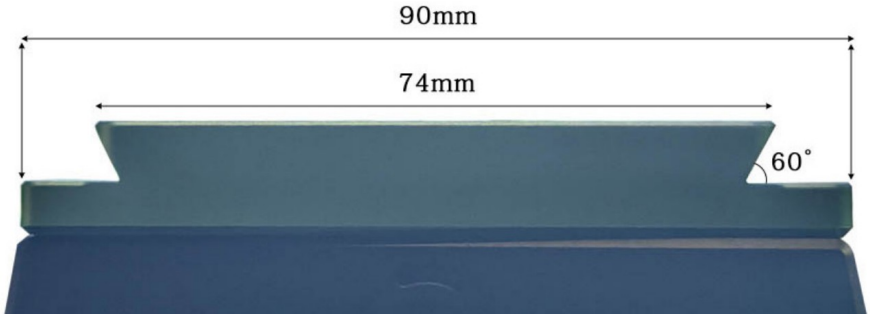
4.1 Connection to the Camera

Make sure that the back focus, i.e. the distance from the corrector, measured from the flat surface of the supplied M48 or M54 adapter, to the camera sensor of the camera is exactly 55 mm (see following illustration).



4.2 Connection to the Mount

The Losmandy style dovetail bar is compatible with most common medium to large equatorial mounts and has a length of 260mm. The specifications can be found in the following illustration.



4.3 Attachment of a Focus Motor

It is possible to attach focus motors from various manufacturers, as in the following example. Follow the manufacturer's instructions.

Note: The focuser must not be operated by hand when a focus motor is attached, as this may damage the focus motor or the focuser.

5 Anti-dew System (Dew Prevention Box)

5.1 System Overview

Condensation on the optics during astrophotography is an annoying problem. To solve this problem, we have developed an anti-dew system. The system automatically activates heating elements for the primary and secondary mirrors when the ambient temperature and humidity reach the dew point.

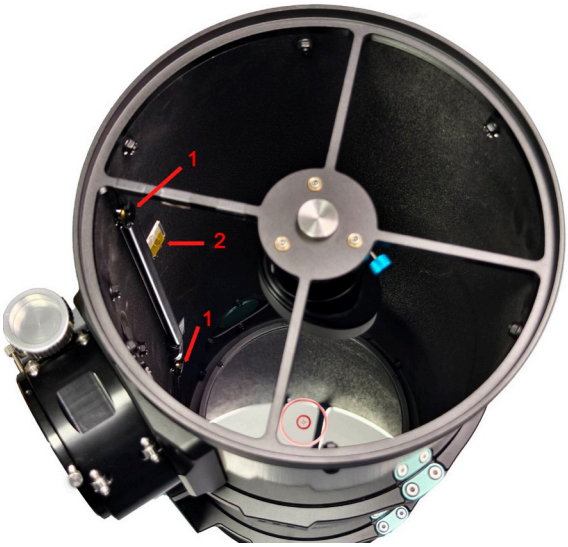
This system includes an integrated temperature and humidity sensor and a microcontroller. It is powered by a standard 12V DC power supply via a DC plug (5.5 × 2.1mm). Once connected, the heater will be automatically activated as soon as the dew point is reached. When connected to a computer, the operation can also be controlled manually and the heating intensity can be set.

Note: The heating can lead to a slight deformation of the mirror. Therefore, the default power in automatic mode is limited to only 3% of the maximum, which raises the mirror temperature slightly above the dew point without overheating. Avoid setting too high a power manually, as this can lead to temporary deformation of the mirrors, resulting in a reduction in image quality. If a reduction in imaging performance is noticeable even at 3%, reduce the power further or switch off the device by disconnecting it from the power supply.

5.2 Disassembly

The power supply for the main and secondary mirror heaters is provided via 2 cables inside the telescope tube.

If it is necessary to dismantle the main or secondary mirror cell, the power supply to the dew control device must be disconnected from the mirror cells at the respective magnetic connector (1):



Interface design: A magnetic quick-release fastener (1) enables easy disconnection from the power supply. Simply lift the magnetic connectors vertically to disconnect the power supply.

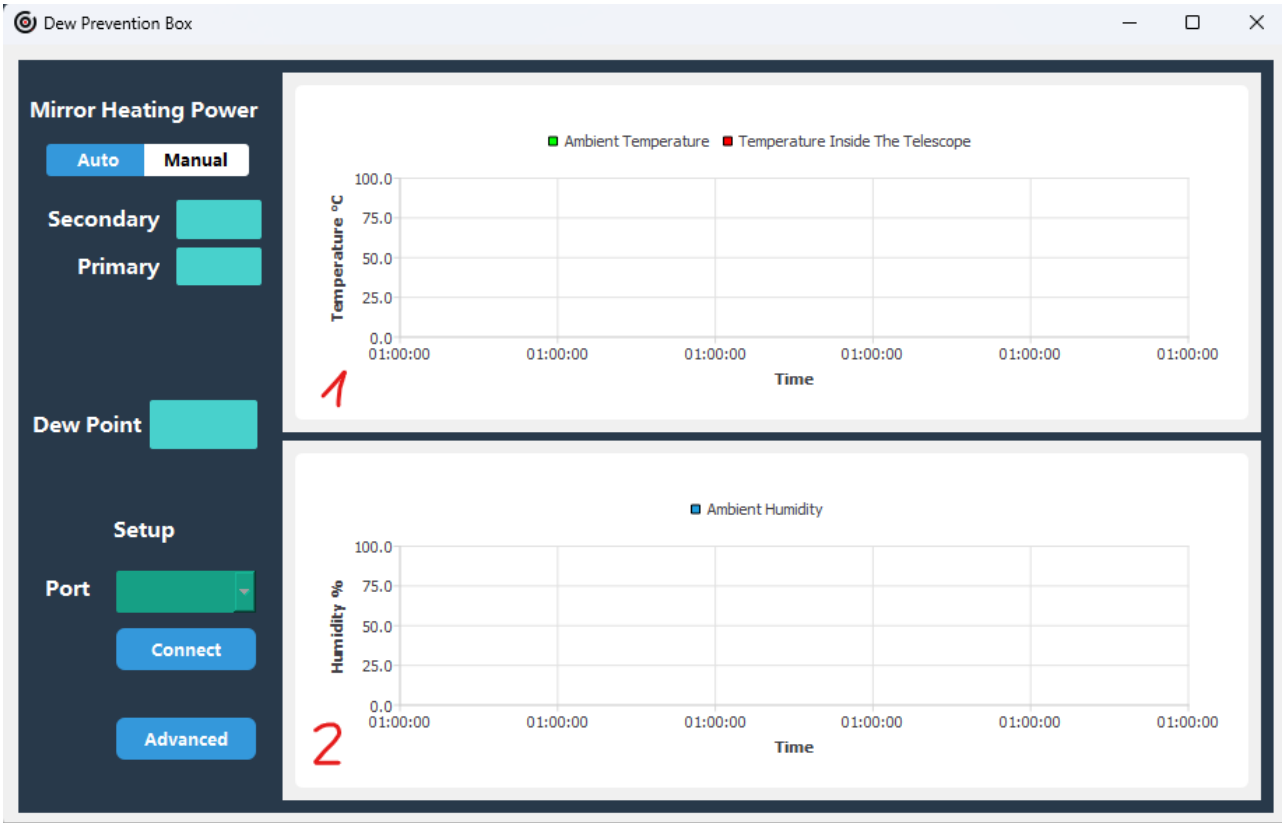
Integrated sensor: A high-precision temperature sensor (2) monitors the conditions inside the tube in real time. When the dew point is reached, the intelligent anti-dew system automatically adjusts the heating power to keep the optical components dry.

5.3 PC Software

Only available for MS Windows!

Download link under https://www.noctutec.com/astronomie-shop/ocal-astrograph/

After installing and starting the software, the following user interface appears:



Operating Instructions:

Connect the Dew Prevention Box on the telescope to a 12V power source (DC plug 5.5x2.1mm)

Connect the USB port of the Dew Prevention Box to your computer.

The user interface is divided into different areas:

- Click on "Connect" in the "Setup" area, select the correct connection under “Port“ if necessary and then click on "Connect". The anti-dew system is now connected to the computer.
- Displays 1 and 2 provide information about the ambient temperature, the temperature inside the telescope and the ambient humidity.
- In the "Mirror Heating Power" area:
  - If "Auto" is selected, the device works automatically
  - If "Manual" is selected, "Secondary" controls the heating power at the secondary mirror and "Primary" controls the heating power at the primary mirror. Enter the desired heating power as a percentage.

Note: The heating can lead to a slight deformation of the mirror. Therefore, the default power in automatic mode is limited to only 3% of the maximum, which raises the mirror temperature slightly above the dew point without overheating. Avoid setting too high a power manually, as this will lead to temporary deformation of the mirrors which can result in a reduction in image quality. If a reduction in imaging performance is

noticeable even at 3%, reduce the power further or switch off the device by disconnecting it from the power supply.

6 Structure of the Telescope

6.1 Removal/Installation of the Main Mirror Cell

The structure of the main mirror cell of the OCAL H-2 is relatively complex. The following pictures and steps show the installation of the primary mirror cell and should help you to better understand the structure. Once you have familiarized yourself with these steps, you can easily disassemble and reassemble the primary mirror cell.

Figure 1: Place the bracket for the main mirror on a flat surface. Lay the power cable for the main mirror heater over the top of the mirror and ensure that it remains inside the bracket. Insert three springs into the recesses provided.

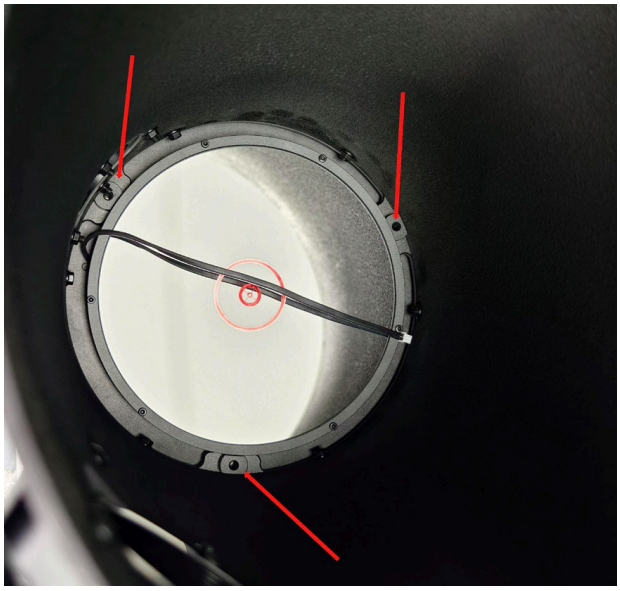


Figure 2: Align the telescope tube with the three recesses for the springs from above and carefully lower it onto the springs. Make sure that the power cable outlet is on the side closest to the anti-dew system.

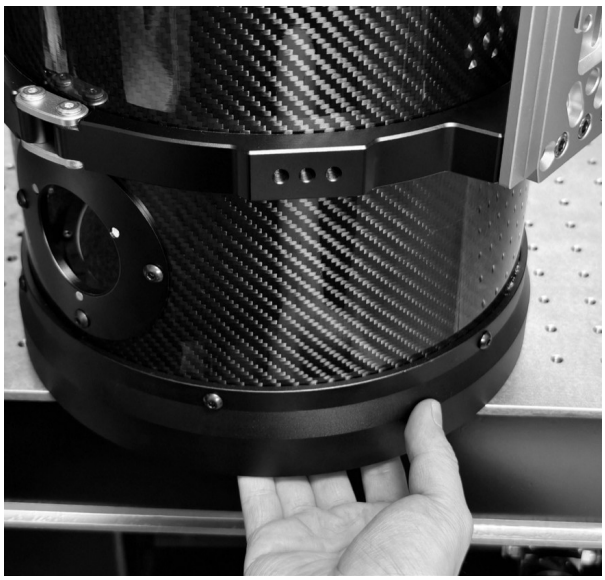


Figure 3: Hold the mirror mount with your hand and turn the entire telescope 180 degrees so that the tube is upside down.

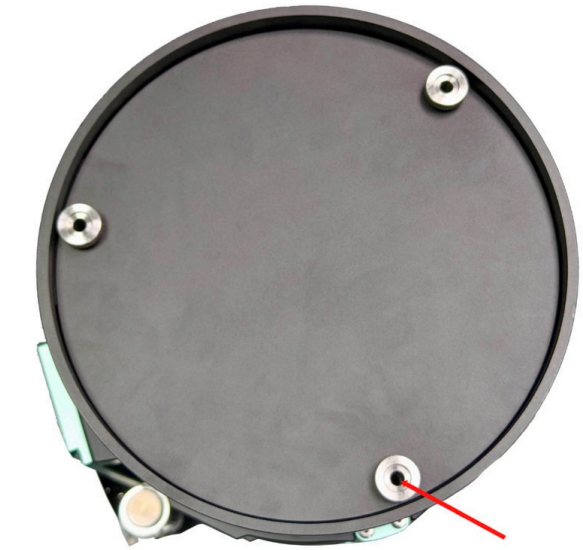


Figure 4: Make sure that the three holes are still aligned with the threads underneath.

Figure 5: Tighten the mirror mounting screws to secure the assembly.

Figure 6: The final position of the mirror mounting screws should be below the edge of the mirror base so that the three exposed rubber limiting strips are clearly visible.

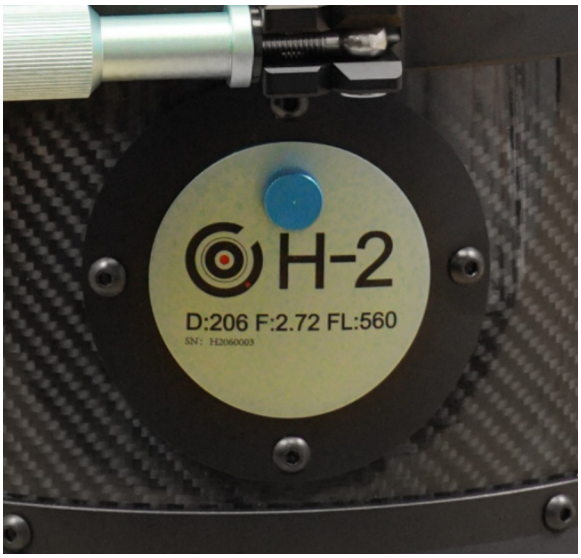
Basic setting: The distance should be approx. 20 +- 1mm.

The height at which the primary mirror is installed determines the focus position. Install the primary mirror so that the focuser is about halfway extended when the device is in focus.

6.2 The OCAL H-2 Inspection Window for the Primary Mirror

The inspection window allows the main mirror to be inspected for dust or foreign objects so that it can be cleaned with a blower, air nozzle or vacuum cleaner.
The inspection window has a magnetic fastening system and can be opened by pulling the blue button.

Note: The inspection window must remain closed during exposure so that the anti-dew system can work properly and to prevent light from entering.
As with all reflector telescopes, the primary mirror must not be touched!



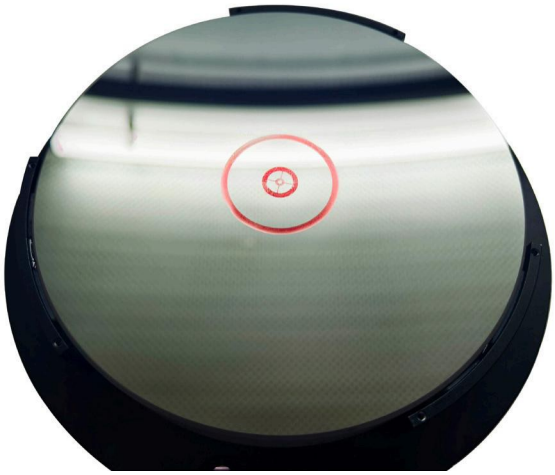
7 Collimation

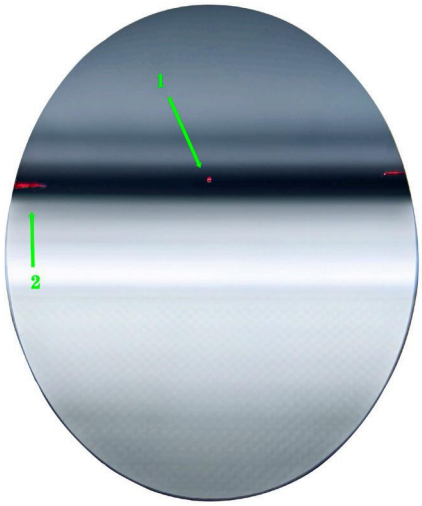
The telescope will be shipped with a basic adjustment. The fast optics require precise adjustment of the optical components and should be checked and, if necessary, fine-tuned by the user.

7.1 Markings on the Primary and Secondary Mirror

The OCAL H-2 has clearly visible markings both in the center of the primary mirror and at the offset point of the secondary mirror to facilitate collimation. These markings have been applied precisely. The primary mirror is marked with a large circle containing a small circle and a cross.

Note: Although these markings on the primary mirror are insoluble in water, they are not resistant to alcohol or organic solvents.





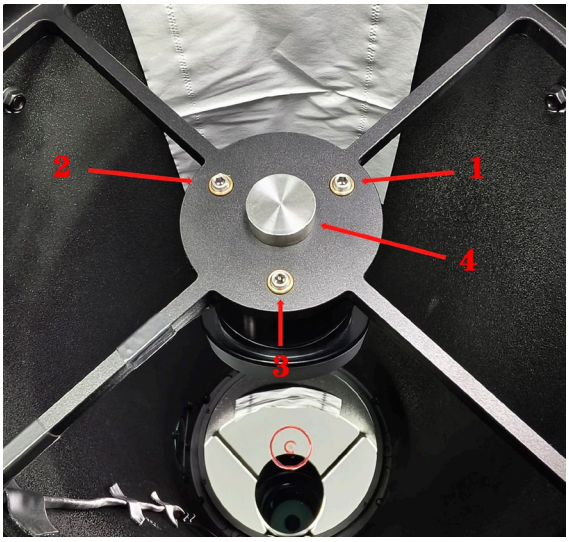
7.2 Collimation of the Secondary Mirror

This section explains how to collimate a telescope with the electronic OCAL collimator. For the detailed procedure, please refer to the official instructions on the website. The following instructions focus on the special features of the OCAL H-2:

We have created corresponding videos to illustrate this adjustment process. Video link:
https://youtu.be/YPpEwidp99s?si=7asEMal3khLZPgrD

7.2.1 Design of the Secondary Mirror Mount

The adjustment screws for the secondary mirror are high-precision fine-thread screws in optical quality with ball bearings on the underside. When tightened, the ball bearing fits into a spherical mount, preventing damage and slippage.

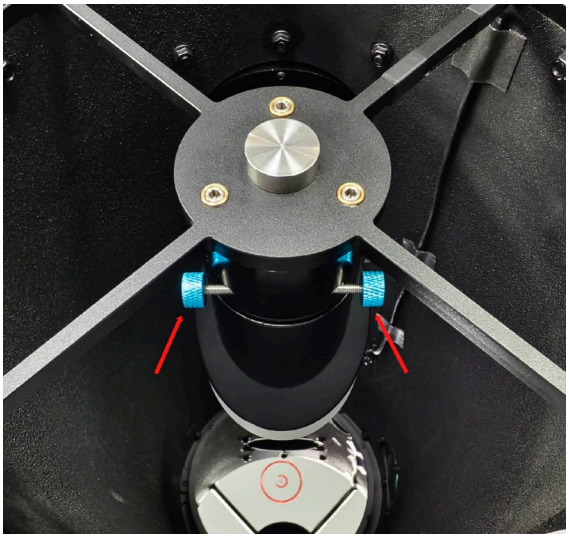


Screws 1 and 2: Adjust the inclination (yaw) of the secondary mirror,

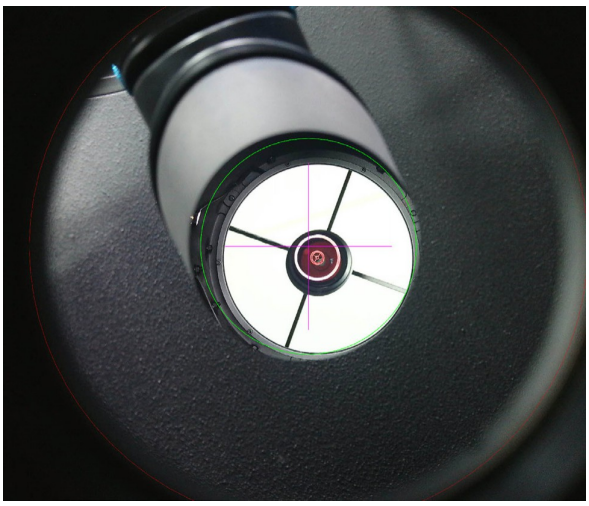
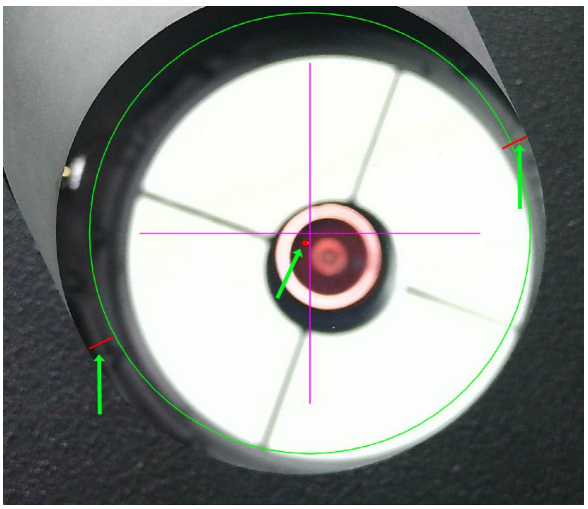
Screw 3: Adjust the vertical inclination (tilt)

Screw 4: Adjust height

Note: Screw 4 must not be loosened too far, otherwise there is a risk of the secondary mirror falling into the tube

	In addition, the H-2 has a rotating secondary mirror holder. You can adjust the angle of rotation by loosening or tightening the two blue screws.

7.2.2 Adjusting the Height of the Secondary Mirror

	Figure 1: Start the collimator software (using the software offset function is not recommended)
	Figure 2: Zoom in and focus until the offset point and the guide lines on the secondary mirror become visible (green arrows). Rotate the cross in the software to a vertical orientation.

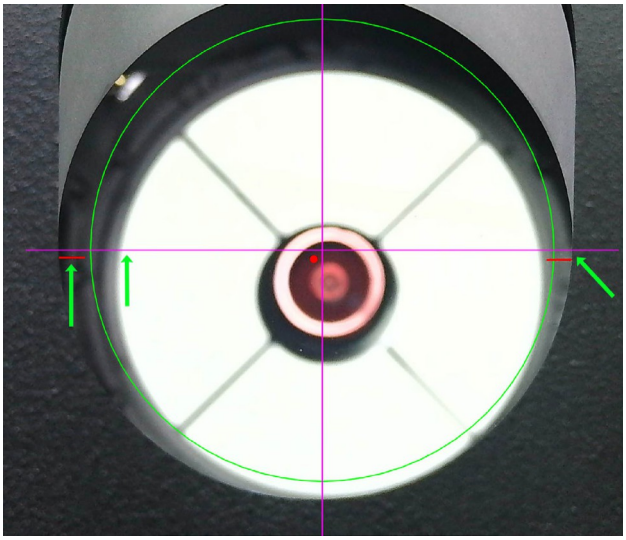


Figure 3:

Turn the rotator (CAA) on the focuser until the guide lines on the secondary mirror are aligned parallel to the software cross.

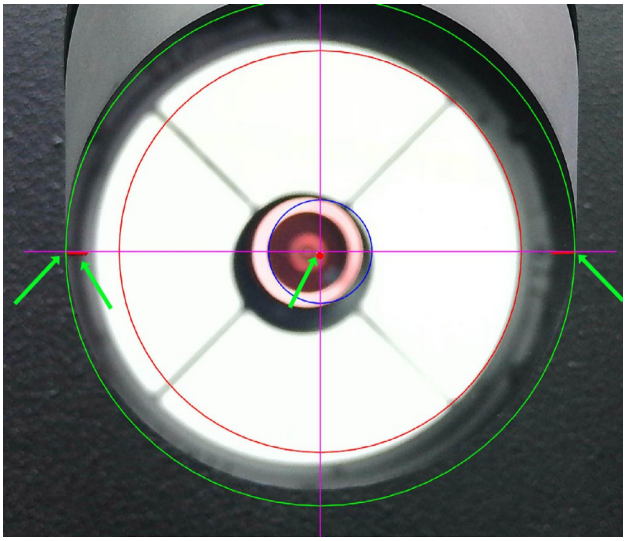


Figure 4:

Screw no. 4 is used in combination with screws no. 1-3 to adjust the height of the secondary mirror. Screw no. 4 is the tension screw, screws no. 1-3 are the pressure screws.

Then use screw no. 4 to align the offset mark and the auxiliary line with the cross in the software. If the offset mark appears below the base line, the mirror is too low

7.2.3 Setting the Rotation of the Secondary Mirror

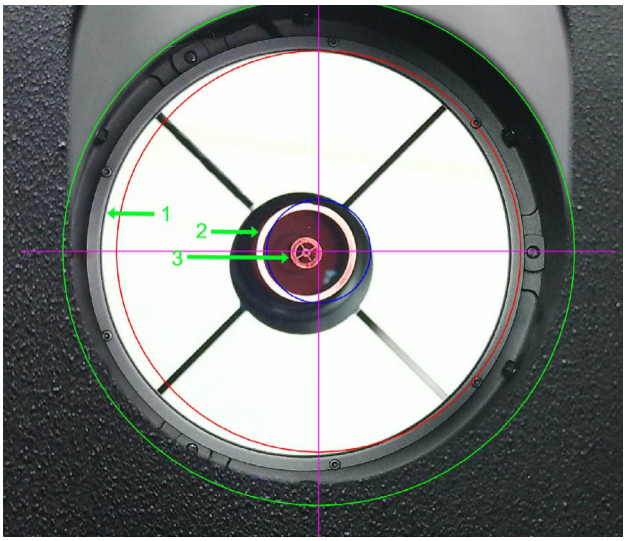
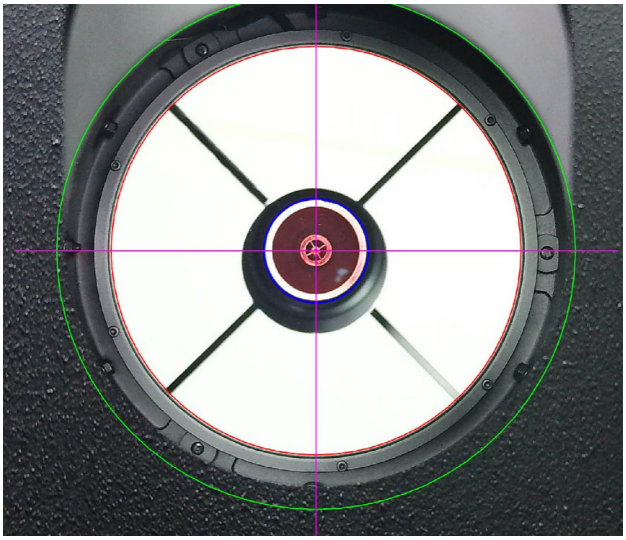


Figure 5:

Concentrate on the reflection of the primary mirror. By turning the two blue adjustment screws, adjust the rotation of the secondary mirror so that circles 1, 2 and 3 are concentric with the red or blue circles. This is a quick but crucial step to achieve correct collimation.



The collimation of the secondary mirror is complete, as shown in Figure 6.

7.2.4 Collimation of the Primary Mirror

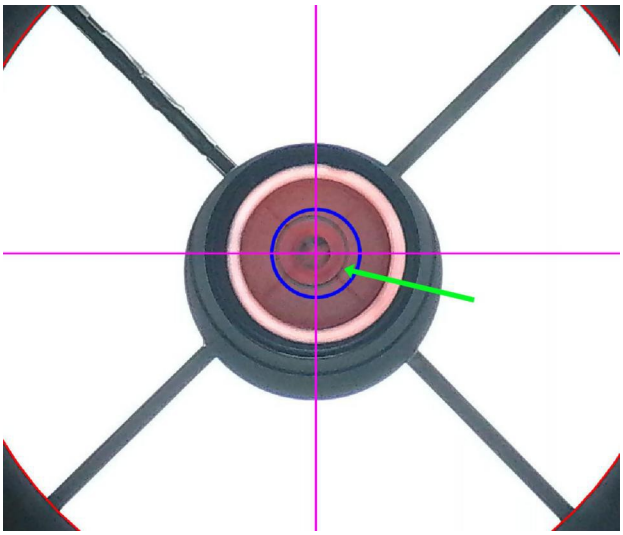
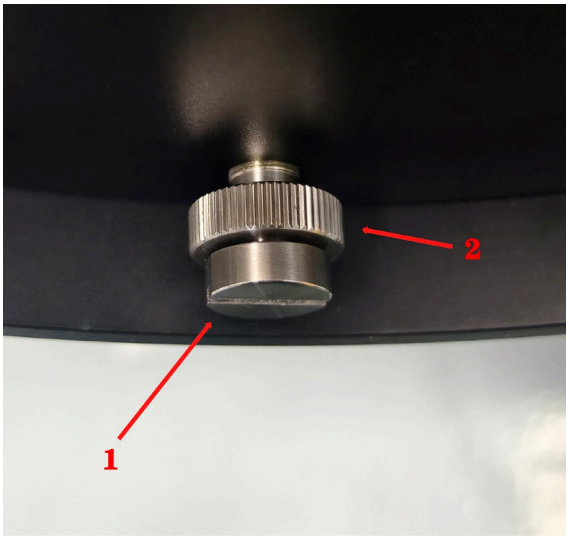


Figure 7:

Once the secondary mirror is aligned, focus the collimator indicator until the black ring of the collimator (green arrow) is visible. Align this black ring concentrically with the blue ring to complete the alignment of the primary mirror (see Figure 8).

Figure 8:



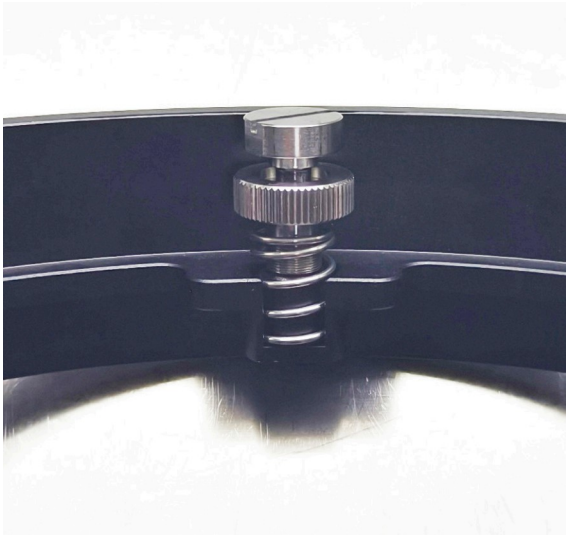


Figure 9:
The adjustment principle for the screws of the main mirror of the OCAL H-2 is based on the "push and pull" principle:

Screw 1 (slotted screw) is the locking screw, Screw 2 (knurled screw) is the limiting screw (see spring construction in the illustration).
The knurled screw has a fine thread, the slotted screw has a coarse thread, so that the two screws lock due to the different thread pitch. Thanks to this sophisticated design, no forces are transferred to the mirror cell that could lead to deformation of the mirror cell.

The two screws work together as a unit when adjusting the main mirror. The screws are adjusted in three steps: First the slotted screw is loosened, then an adjustment is made with the knurled screw, and finally the slotted screw is tightened again to fix the position.

Proceed as follows for the adjustment:

- Determine which screw unit needs to be adjusted:
  Loosen one of the slotted screws at a time and observe on the screen in which direction the adjustment changes. If the adjustment does not move in the desired direction, tighten the slotted screw again and move on to the next screw.
- Once you have found the correct screw unit, move the knurled screw and tighten the slotted screw again. Observe how the adjustment has changed and gradually approach towards the optimum setting.
- Make similar adjustments to the other screws until the optimum adjustment is achieved.

Then finally tighten the slotted screws

An instruction video is also available:
Video link: https://youtu.be/b2jMk2hlr6E?si=VVGLuit3JAAnX46Y

8 Imprint and Support

Translation of the user manual by noctutec with the kind permission of OCAL**noctutec**

Armin Erndt
Götzendorf 46
91330 Eggolsheim

www.noctutec.com
info@noctutec.com

noctutec is the distributor of OCAL for Germany and Europe

We are personally available to help you. You can write to us directly at info@noctutec.com.

Further links to the software download and video instructions can be found at:
https://www.noctutec.com/astronomie-shop/ocal-astrograph/

You can also contact the manufacturer OCAL directly. OCAL provides the following options and offers exemplary support:

Official website: www.ocalworld.com/en/
By mail: huogo558@gmail.com
By We: WeChat ID:175768073
On Twitter: https://twitter.com/ocalworld
With Whatsapp: https://chat.whatsapp.com/BPaq1z5sC5N8sY8kgjqGBZ
On Facebook: https://www.facebook.com/groups/231817878809111/

Product upgrades and feedback:
We are constantly working to improve our products and the user experience. Your feedback and suggestions are always welcome. Announcements about new features and updates will be published on our official website.

Thank you for your continued support!

You can find many interesting products in our store

https://www.noctutec.com/astronomie-shop/