# ESATTO robotic focuser

## USER MANUAL

VERSION 3.4

Update 11-06-2026




**ESATTO 2”**




**ESATTO 2” LP**




**ESATTO 3”**




**ESATTO 3,5” LP**




**ESATTO 4”**

ESATTO is manufactured by PrimaLuceLab SpA (Italy). For any matters relating to the use, service and warranty, please refer to the addresses given in the relevant documents.

# English

**WARNING**

If improperly handled, ESATTO may be damaged. Please follow the instructions below:

- Do not disassemble the unit
- Do not drop, subject to excessive impact open, or subject to electric shock any part of ESATTO.
- Do not short the electronic elements
- Do not expose to temperatures below -20°C and above +60°C
- Do not burn or incinerate any component.
- Do not expose to rain or other atmospheric effect related to water
- Do not bend, modify or force any part of ESATTO

## QUALITY CONTROL

After being manufactured in our laboratories, each ESATTO unit is tested by PrimaLuceLab technical experts to verify all mechanical and electronic components, then perform a calibration of the focuser so that is ready to use. If you find any malfunction, please contact us immediately (+ 39-0434-1696106 or support@primalucelab.com). Do not try to disassemble, repair or modify the ESATTO yourself, without our written approval, in order maintain the manufacturer's warranty.

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# Component Identification







## Package contents

- ESATTO robotic focuser
- 2mm Allen key
- 12v Power cable for cigarette plug
- USB-C to USB cable
- ESATTO quick start guide

**NOTE**: since ball bearings are made up of steel (and not stainless steel) in order to provide the requested load capacity for the draw tube, in case of high humidity you can see some oxidation effect like in this picture. In this case you can clean the ball bearing with a cleaning product like WD40.



# Technical specifications

| | ESATTO 2” | ESATTO 2” LP | ESATTO 3” | ESATTO 3,5” LP | ESATTO 4” |
|---|---|---|---|---|---|
| Power | 12V or through USB - 5.5/2.5 connector - positive tip polarity | | | | |
| Power consumption @ 12V | max 350mA | | | | |
| Working temperature | -20°C / +60°C | | | | |
| Payload capacity | 5 kg | 5 kg | 8 kg | 10 kg | 10 kg |
| Control with: | USB<br>WiFi | | | | |
| Resolution ($\mu$m/step) | 0,04 | 0,03 | 0,04 | 0,01 | 0,04 |
| Travel | 15mm | 10mm | 25mm | 10mm | 35mm |
| Thread on draw tube | M56x1 male | M60x1 male | M81x1 male | M98x1 female | M110x1 male |
| Body thickness | 67mm | 32mm | 77mm (including flange) | 32mm | 91mm (including flange) |
| Temperature probe | Internal to read motor temperature (in the package)<br>External for focus temperature compensation (optional) | | | | |
| Calibration sensor | For automatic detection of max in and max out positions. Max in only for LP versions. | | | | |
| Provided software | Driver for Windows 64 bit (compatible with Windows 10, 11)<br>PLAY for control with Windows 10/11 operative system<br>ASCOM driver for control from external software (tested with ASCOM platform 7)<br>Virtual HandPad for WiFi control | | | | |
| Weight | 835 gr. | 730 gr. | 1345 gr. | 1150 gr. | 2050 gr. |

**NOTE**

In order to proceed with installation you have to download the ESATTO software package from the

**DOWNLOAD**

section of our www.primalucelab.com website.

Save the package (it’s in zip format) onto the EAGLE or computer you want to use to control the ESATTO and unzip it with the proper unzip software (You can right-click and select “Expand” or you can use software from https://www.winzip.com).

**CAUTION**

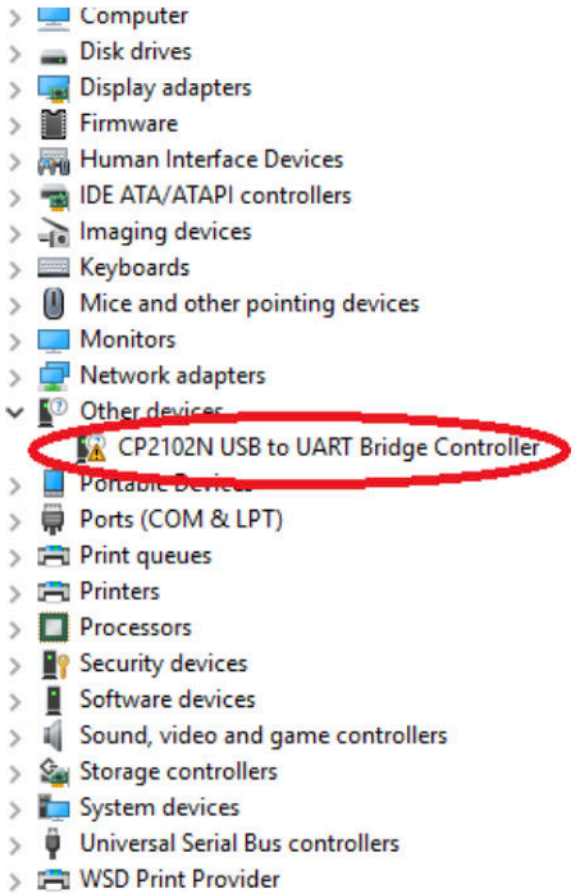
In order to correctly use ESATTO, you have to connect it to your telescope. First you need to connect the optional telescope adapter, and then install ESATTO to the adapter, locking it by using the supplied Allen screw or the thumb screws (based on the ESATTO model you have). The installation procedure changes based on the telescope model and adapter you have so please refer to the following information. To test connectivity from Windows or your mobile device, you can proceed with the ESATTO first use without the focuser being installed on the telescope, following the steps outlined in this user manual.

**IMPORTANT**

If you're using LP version of ESATTO, in order to connect it to the telescope adapter you have first to extract the focuser draw tube and you will find grub screws that are needed to lock it on telescope adapter.

## Install ESATTO in EAGLE or Windows 10/11 computer

ESATTO can be installed in the EAGLE or an external computer running Windows 10 or 11 operating system. In the ESATTO package you will find a 12V power cable with cigarette plug style connector, and a USB cable for connection to a PC. If you have a PC with a USB 3.0 port that supplies at least 1A of current (please refer to your PC specifications) you can control and power ESATTO only with the supplied USB-C cable, otherwise you must use the 12V power cable with cigarette plug (or an optional 12V AC adapter with Ø5.5 ø2.5mm jack capable of at least 1A).

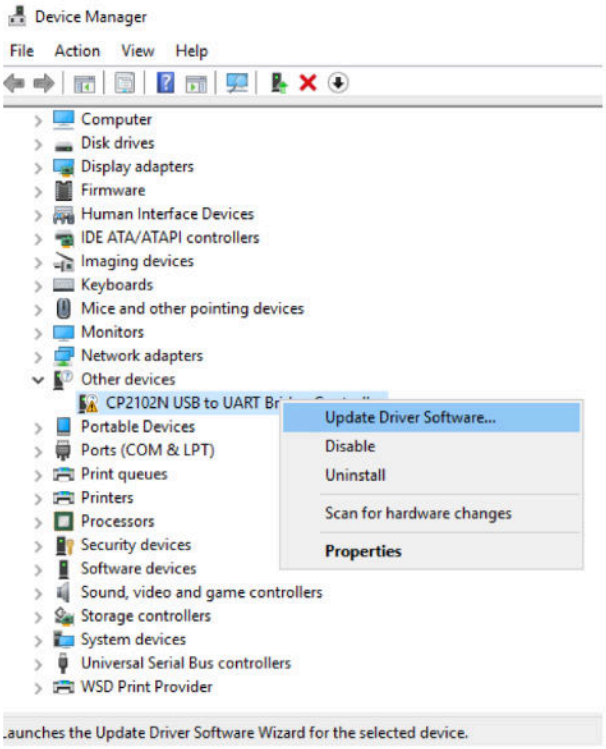



Connect the USB-C cable to the USB port of your EAGLE or personal computer. You will see the PWR LED on (this means ESATTO is powered) and, after a few seconds the Wi-Fi LED will also be become lit - This means that the ESATTO is online and the WiFi connection is ready to be used.

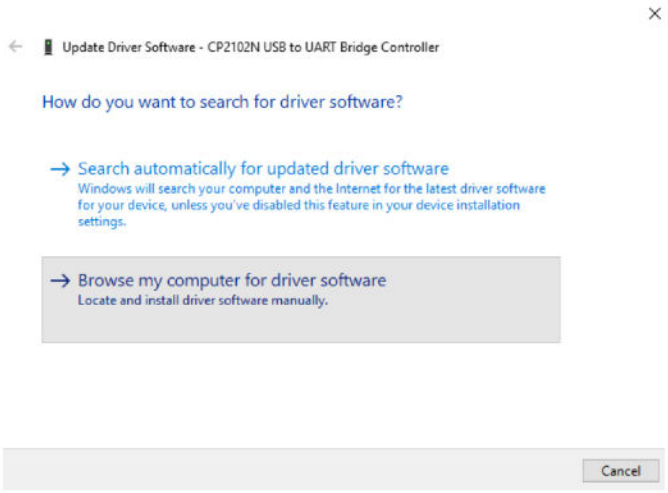
Once connected the ESATTO should be automatically detected and Windows should automatically install the new driver. To verify this this, please go to Control Panel and then choose Device Manager. You should see the ESATTO listed under "Ports (COM & LPT)" and described as "Silicon Labs CP210x" (in order to check, you can disconnect and then reconnect the ESATTO USB cable and see how Windows lists it).

If you can't find it, Windows is not able to automatically install the ESATTO driver. In order to do this, please follow this procedure:

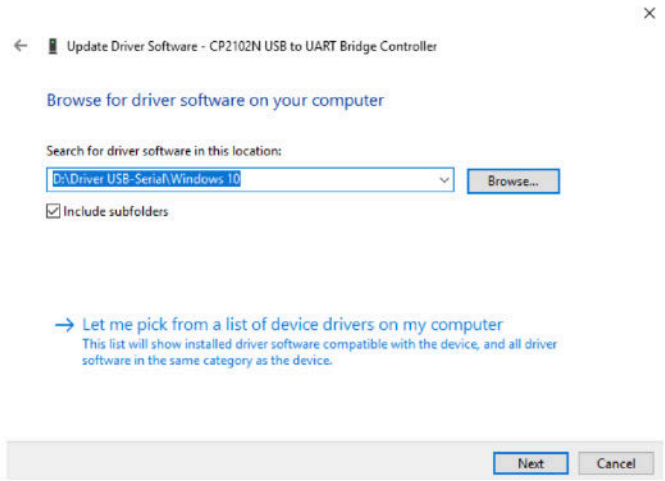
1) go to "Device Manager"
2) locate "CP2102N USB to UART Bridge Controller" under "Other devices"




3) Right-click on the device and select "Update Driver Software”

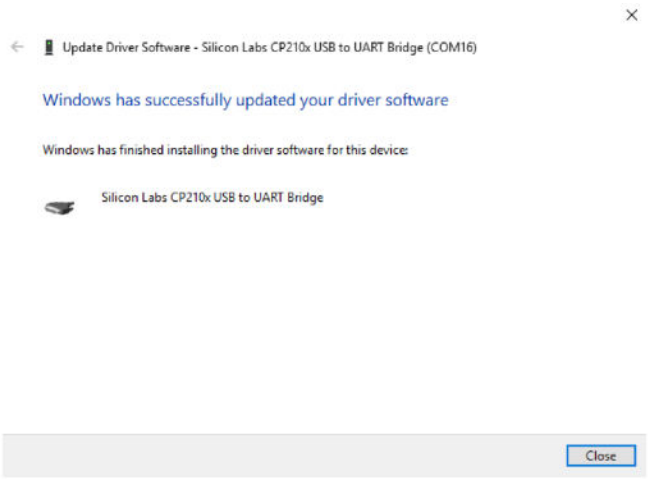



4) select the second option “Browse my computer for driver software” in order to specify the location of the downloaded driver.

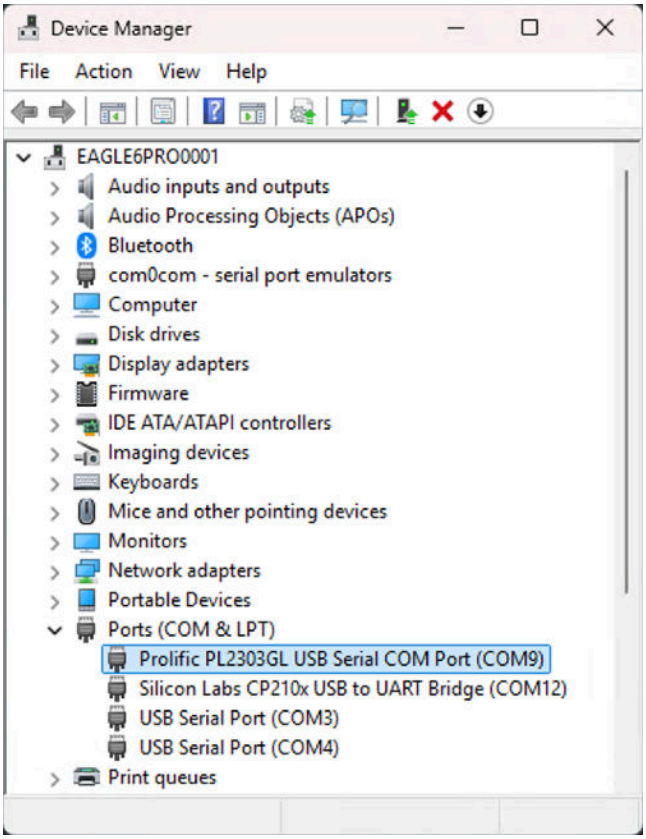



5) Select the folder where you saved and expanded the ESATTO software package you downloaded from our website, click “Next” and complete the installation procedure.

(Please remember to unzip/expand the file you downloaded before starting the installation of the ESATTO)




6) at the end of the procedure, a message will appear indicating successful installation.




Now, under COM and LPT devices, you will see a new COM port (in this example COM16) which is the one used by your computer to communicate with ESATTO.

**NOTE: If the driver is not correctly installed on your Windows operating system, ESATTO will not be able to connect to your EAGLE or external computer and will not function. Make sure the COM driver is properly installed before proceeding to the next step.**



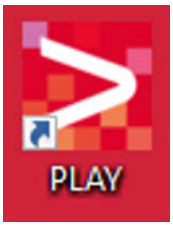

After completing the driver installation, we recommend checking the default power settings applied by Windows and optimizing them for use with telescopes. Right-click on the newly installed driver and select “Properties.” In the window that opens, go to the “Power Management” tab and uncheck the option “Allow the computer to turn off this device to save power.” Finally, click OK to confirm.

# Control ESATTO with PLAY software

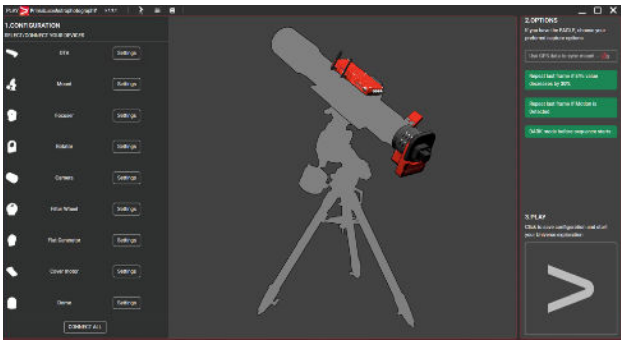
If you want to control ESATTO with the EAGLE or a Windows 10/11 computer, you can use our PLAY software you can download from the DOWNLOAD section of our website. **In order to use ESATTO with PLAY, you have to use the ESATTO firmware at least version 3.0. Please refer to the "Update ESATTO firmware with PLAY software" paragraph in order to read how to update ESATTO firmware.**



Double click on PLAY-setup.exe file to start installation, you will see an animation during the installation procedure.



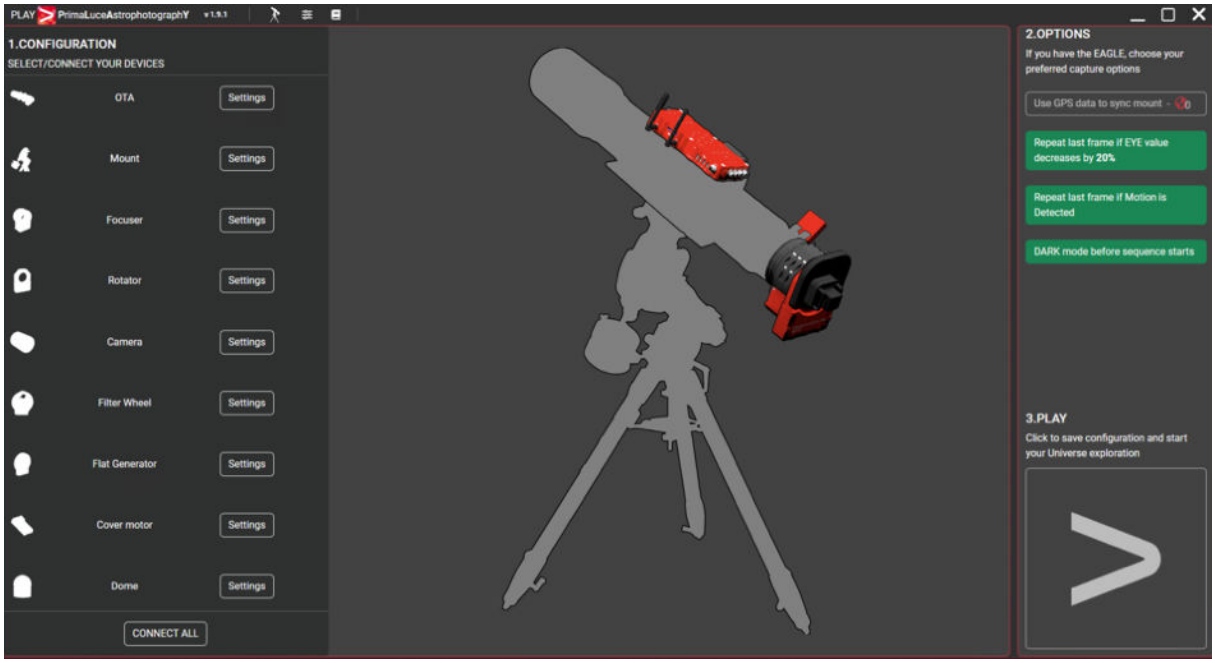

Installation process automatically creates a shortcut on the operative system Desktop.



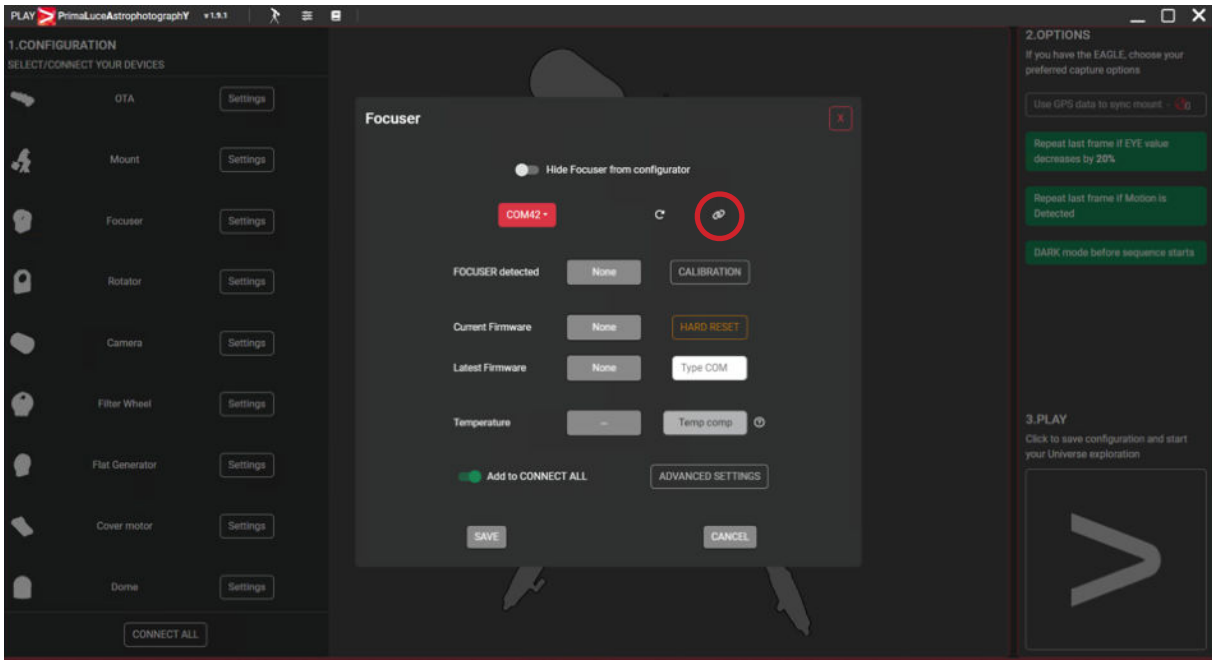
At the end of the installation process, PLAY is automatically launched.

PLAY software allows you to control not only ESATTO focusers but also other devices that may compose your telescope. For this reason, PLAY starts with the CONFIGURATOR section where you have to connect your devices first, and then you can proceed to the CAPTURE section that allows you to control the connected devices.

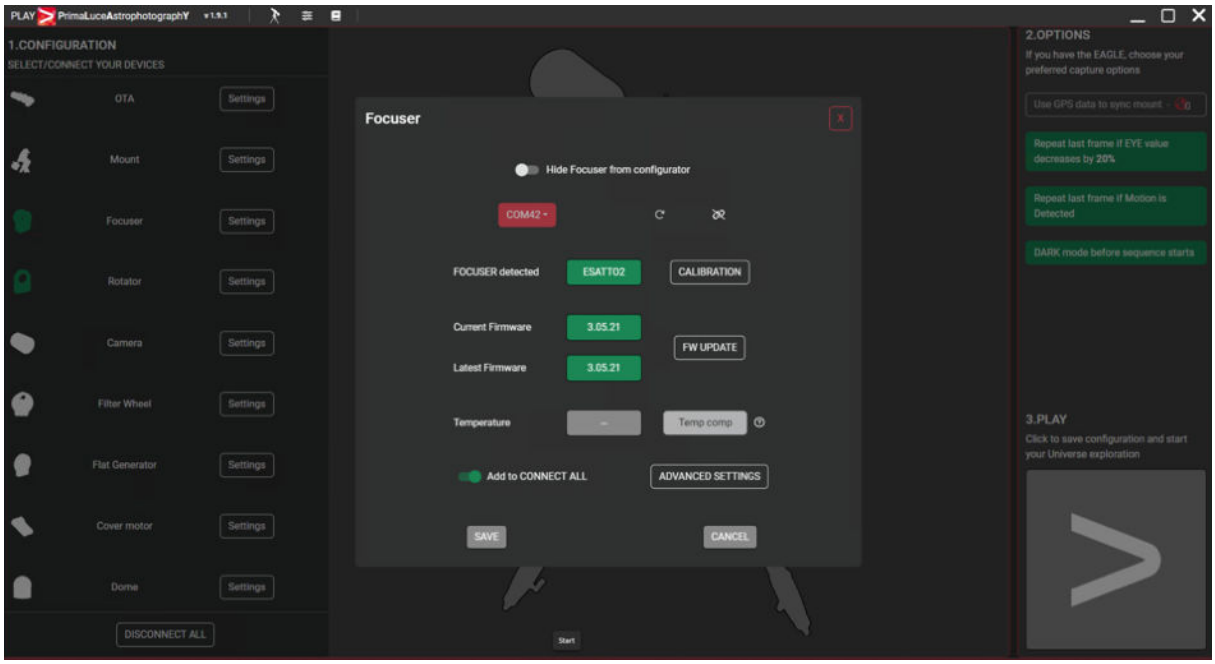
1) Launch PLAY software and you will see the **CONFIGURATOR** section where you have to connect your devices.




2) Click on the **Focuser** section (you can click both on the Focuser shape of the central image or on the Focuser text in the left column). This will open a popup window where you can set the COM port number associated to your ESATTO focuser. If you don't know what is the COM port associated to your ESATTO, you can enter in Windows Device Manager and check what COM port number Windows creates when you plug the USB cable of your ESATTO focuser. In order to better identify it, you can also connect and disconnect the USB cable since this will update the Device Manager list. The press the **Connect** icon in order to start the connection to your focuser.



3) If the connection is correctly set, the button to the right of “FOCUSER detected” will become green. You can now press the **SAVE** button to confirm and exit.




**What happens if I can’t connect by pressing the “Connect” icon?**

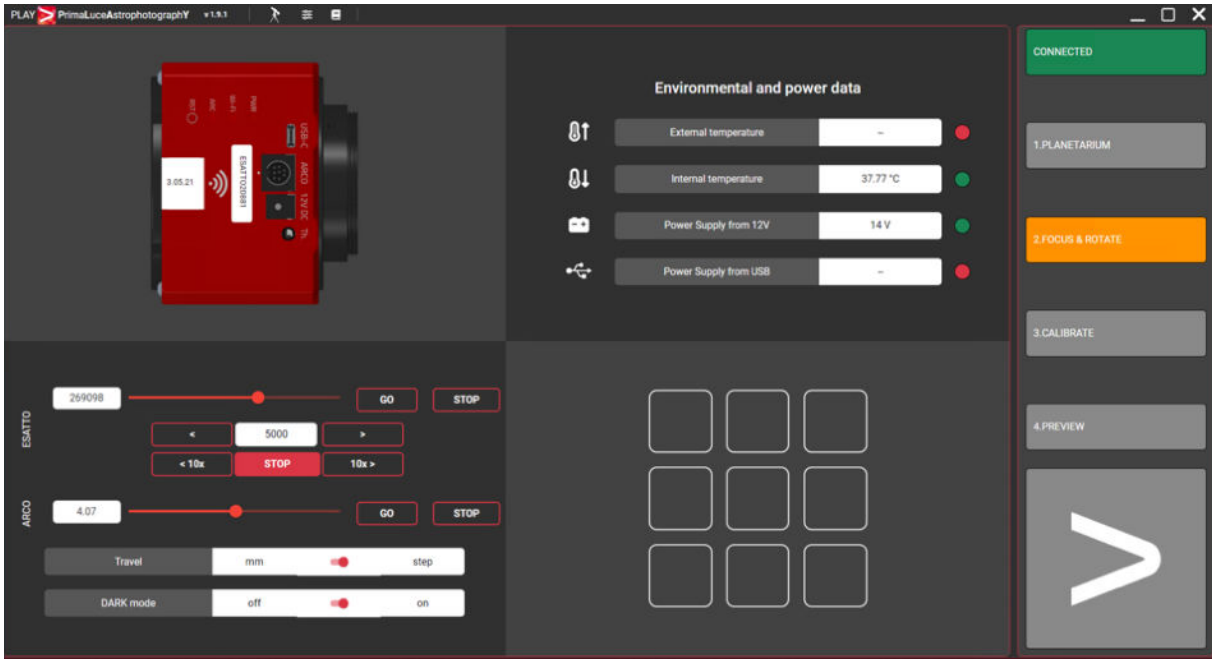
At this stage, if you can’t connect to ESATTO by pressing the “Connect” icon, please check the COM port number that your EAGLE or Windows computer assigned to the ESATTO. To do this, go to Control Panel -> Device Manager > Ports (COM and LPT) and search for the ESATTO COM port number. This is the number you have to select in PLAY software, before attempting a connection.

4) Now that the connection to your devices is confirmed, please click on the large **PLAY** button (bottom-right) to proceed to the **CAPTURE** section of PLAY software where you will be able to control your devices and start astrophotography.

**NOTE**

If your ESATTO focuser has a not updated firmware version, now you will see a notification and PLAY will update ESATTO. Please follow the onscreen instructions in order to install the updated firmware. In this case, please refer to the next “**Update ESATTO firmware with PLAY software**” paragraph.

5) At the top-right part of the screen you can see the green CONNECTED notification that shows you that the devices, the you set in the previous steps, are connected. The **FOCUS & ROTATE** tab is now selected and here you can see the connection to ESATTO focuser.




Under the "**Environmental and power data**" you will see the lights on the right side of the window become green:

1) if you connect ESATTO to your computer only with the USB cable, you will see a green light illuminated in the right of the "Internal temperature" row
2) If you have connected an optional temperature sensor, you will also get the green light in to the right of "External temperature" row
3) if you power the ESATTO also with an external power source (a 12V battery by using the supplied cigarette plug cable, a 12V AC adapter with at least 1A and Ø5.5/2.5mm connector or the EAGLE power cable to power it through the EAGLE) you will get the green light to the right of the "Power supply from 12V" row.

**NOTE on internal temperature values**

Here you can read the internal motor temperature, it's normal to see values from 10 to 50 °C.

Moving the ESATTO focuser is very easy. You can do this in different ways:

1. Move the slider until you reach the desired position and press the **GO** button
2. Click on the area to the left of the slider, enter the number you prefer and then press the **GO** button
3. Click on the area with "mm" label, insert the number you wish and press the **<** or **>** buttons to move the focuser by the number you entered. Press the **<<** or **>>** buttons to move the focuser by 10 times the number you entered.

You will see the focuser moving. At any moment you need to stop the movement of the focuser, press the STOP button in the lower part of the window.

**NOTE**: if during the focuser movement you see a very small shift of the image, this is normal and it's caused by the special modified Crayford design to let the ESATTO have a higher load capacity than standard Crayford focusers.

**NOTE:** If you can't see any movement, maybe you set a too small value to be seen.

**What happens if I see the focuser moving but it stops abruptly?**

This typically means that the ESATTO does not have enough power caused by being only connected via USB power, to a personal computer with USB ports that deliver less than 0.5A. In this case you must also connect the power port on the ESATTO to a 12V power source and restart PLAY software.

4) Thanks to the use of internal sensors, every ESATTO robotic focuser is already calibrated and you don't need to start a new calibration in order to set the minimum and maximum position of the focuser draw tube. Calibration data is automatically stored in the ESATTO's memory so you won't need to calibrate ESATTO when switching between computers.

5) In the bottom-left area of PLAY window, you can find the settings of the focuser. Here you can set:
   - *Travel*: it allows you to show and set the travel measurement units in mm or steps.
   - *DARK mode*: it allows you to activate DARK mode that will turn off focuser's LED lights (please note that, if you turn them off, you won't be able to check the ESATTO status without controlling it via the provided software).




**Note on ESATTO 2", 3" and 4" autofocus accuracy**

The ESATTO 2", 3" and 4" focusers (not LP) utilise a Crayford-style design, chosen specifically to deliver smooth and precise focusing. Because of its mechanical design, minor variations in step position after multiple autofocus runs are expected and considered normal behaviour. Particularly when using very fast optical systems (e.g., f/3), users may observe a gradual shift in the calculated focus position across repeated autofocus routines. This is not indicative of mechanical slipping in the traditional sense, these shifts are typically small (on the order of tenth of millimetres) and may accumulate over many dozens of autofocus runs.

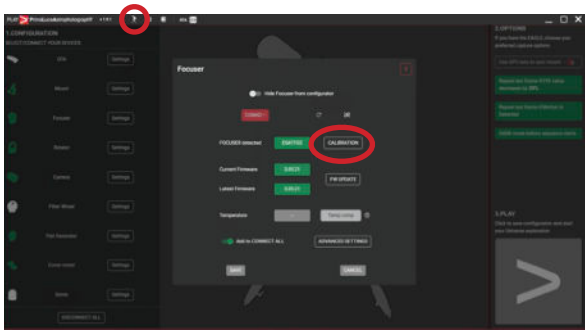
Recommended solution: if you notice that the focus position is gradually drifting over time after multiple autofocus routines, we recommend performing a new automatic Calibration using PLAY control software especially when the change exceeds half of the total focuser draw tube travel. This will reset the internal reference of the focuser and ensure optimal accuracy in the mechanical configuration. This calibration does not need to be repeated frequently. In most cases, it is only necessary after prolonged use, or if you detect a consistent shift in focus after many autofocus routines. Note: This behaviour is distinct from backlash and does not require backlash compensation to be enabled or adjusted.

**ATTENTION**

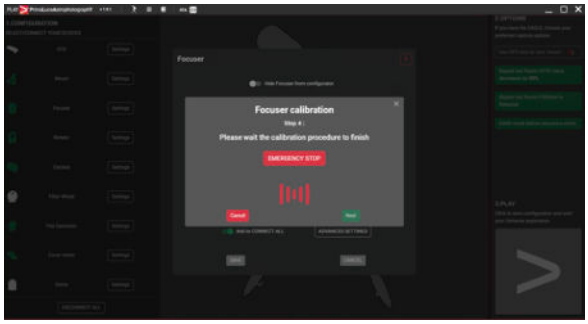
In the event you need to manually reset ESATTO please proceed this way: with the ESATTO not connected to USB port and without power, press the "RST" reset button (keep it pressed for 10 seconds) and, at the same time, connect to power. The ESATTO will reboot and it will be reset to factory settings.

# Calibrate ESATTO with PLAY software

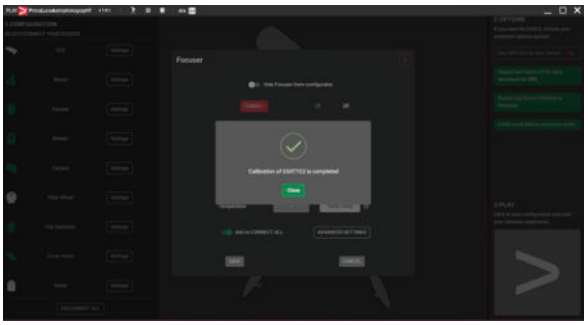
Thanks to the use of internal sensors, every ESATTO robotic focuser is already calibrated and you don't need to start a new calibration in order to set the minimum and maximum position of the focuser draw tube. But, if you need for any reason, please follow this procedure.



If you're in the CAPTURE section of PLAY, please click on the CONFIGURATION settings to come back to Configuration area. Then click on the Focuser text in the left column or on the Focuser shape of the central image to open the focuser settings. Then press the **CALIBRATION** button.



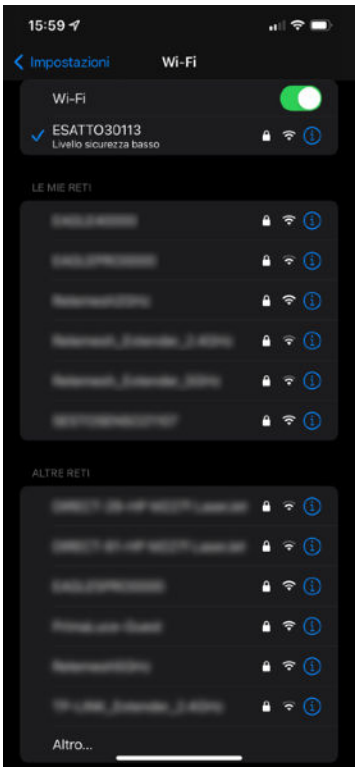

A new window will appear and focuser calibration will proceed.



You will see the ESATTO robotic focuser draw tube moving searching for the minimum and the maximum position. Please wait (usually 2-3 minutes) and the new calibration will be automatically saved by the PLAY software. Press the **CLOSE** button to complete the Calibration procedure.

# Control ESATTO with Virtual HandPad

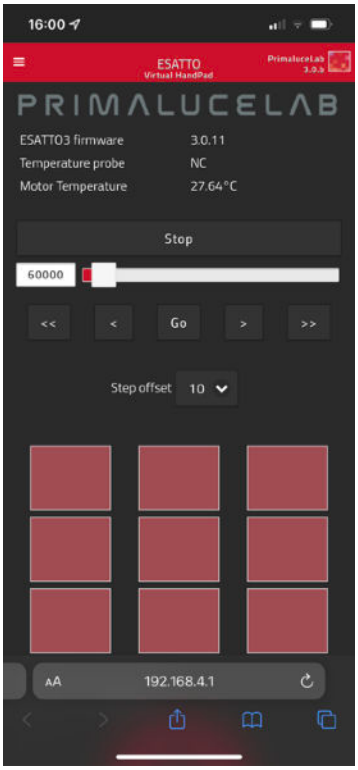
ESATTO can be controlled without the need of an EAGLE or computer, by connecting from any smartphone or tablet (also a computer) with WiFi and using the included Virtual HandPad. In order to set the WiFi control, please follow this guide (that has been created on a smartphone with iOS operative system but it's similar for Android devices).



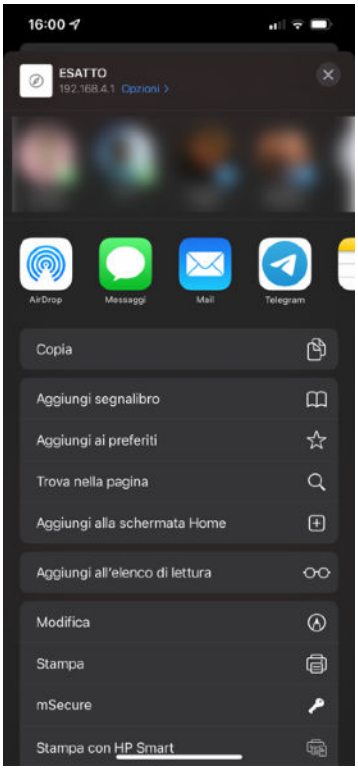

After you power up the ESATTO (you can do this both by connecting to a USB port of the EAGLE or of a computer or by connecting to the ESATTO a 12V power supply with at least 1A capacity), turn on the WiFi of your device (that can be a smartphone or a tablet).

**Please note that you can't control ESATTO with WiFi (Virtual HandPad) and USB (PLAY) <u>at the same time</u>. If you want to control it with WiFi through the Virtual HandPad, please make sure it's disconnected from PLAY.**

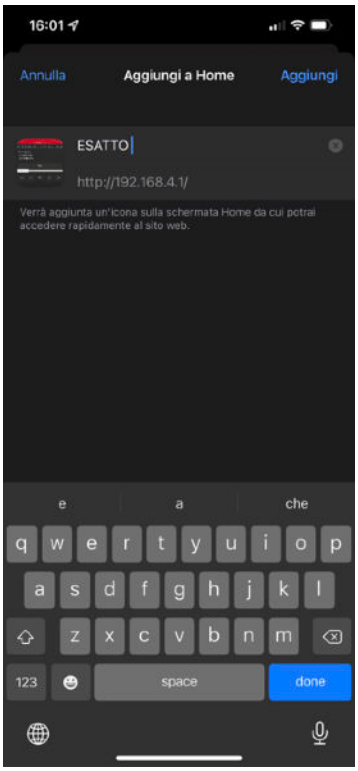
You will see the ESATTOxxxxx network created by your ESATTO, the network name corresponds to your ESATTO serial number. Select the ESATTOxxxxx network. Using the keyboard (virtual or physical) of your device insert "primalucelab" as the default password (or the password you chose with PLAY software) and then press the "Login" button. The next time you want to access your ESATTO, you will no longer have to enter the password: your device will automatically connect when you select the network created by ESATTO unless you change the login password. Wait for a few seconds until you get confirmation that your device is connected to the ESATTOxxxxx network.




Now you can open the browser of the device (for example Chrome or Safari), in the url area (in the field where you usually write the url like www.primalucelab.com), type the address 192.168.4.1 and press the button RETURN: you will see the Virtual HandPad on your screen.




To create a link directly to your device desktop, simply press the "share" button and then "Add to Home".




You can personalize the name, or just leave "ESATTO". Press Add button to confirm.




The ESATTO connection will be created and you will have a direct and immediate connection to ESATTO in your device.

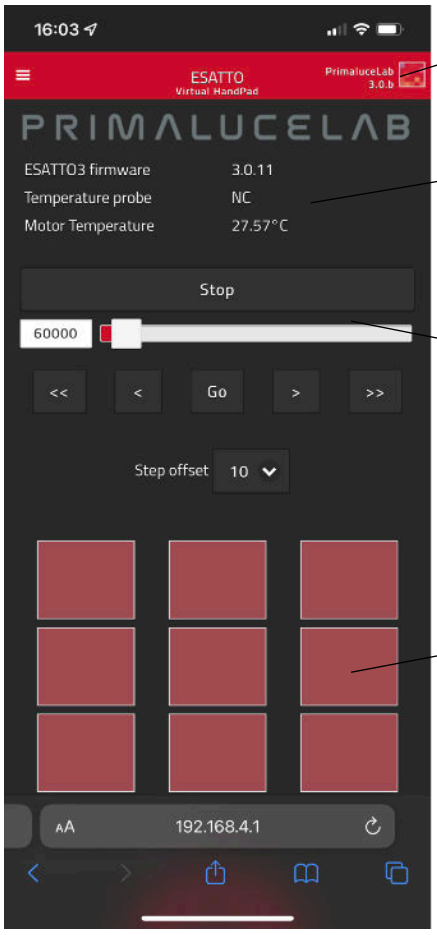
Press the ESATTO button to start the Virtual HandPad.

The Virtual HandPad allows you to control and use ESATTO focuser without the need of an EAGLE or of a computer.

On the top-right of your screen you can find the Virtual HandPad version. Then you can read the ESATTO firmware version, the external temperature (if you connected the optional temperature sensor) and the internal motor temperature.

Below you can find the slider and the button to move the ESATTO, together with the step selector.

In the lower part you can find the 9 programmable buttons that allow you to save up to 9 different focus positions, name them and easily recall focus position with just the push of a button.

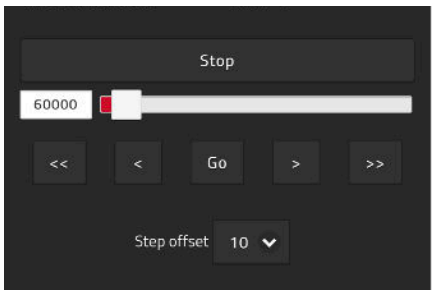



Virtual HandPad version

Settings

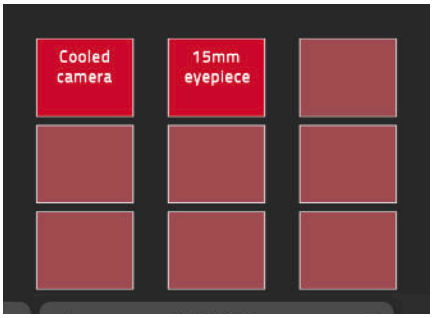
ESATTO controls

Presets buttons




Moving the ESATTO focuser with the Virtual HandPad is very easy. You can do this in different ways:

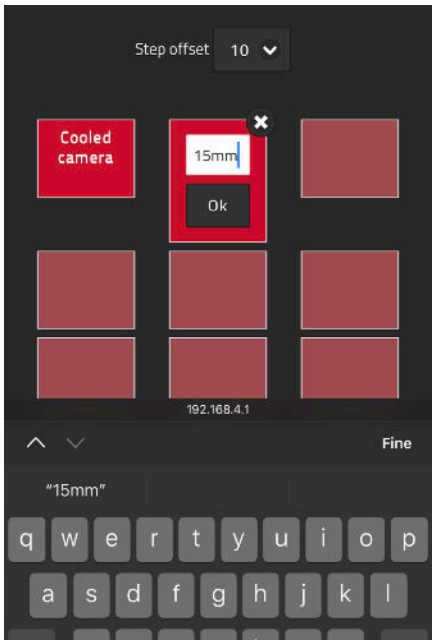
1. move the slider until you reach the desired position and tap on the **GO** button
2. make a double tap on the left field (where you can read the number in step of your focuser), write the number you prefer with the virtual key-board of your device and then press the **GO** button
3. select a value in the “Step offset” selector (from 100 to 2000 steps) and tap the **<** or **>** buttons to move the focuser by the number you selected. Tap the **<<** or **>>** buttons to move the focuser by 10 times the number you selected.




In any moment, if you need to immediately stop the movement, press the STOP button in the upper part.

In order to save a new position in the Virtual HandPad, first of all you have to move the ESATTO focuser to a position where your telescope is in perfect focus (you will need an optical accessory or a camera in order to do this) and then follow this procedure:

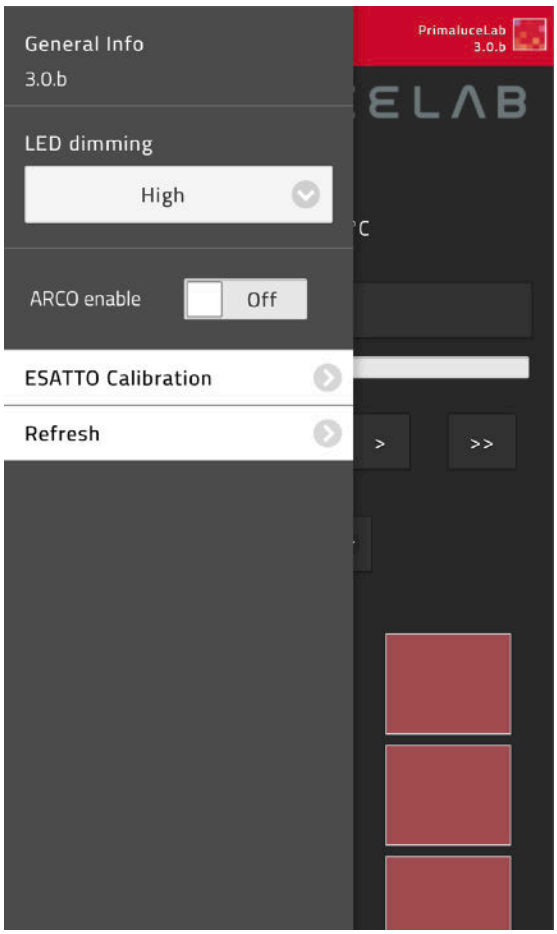
Tap and keep your finger on one of the empty buttons: the position will be automatically saved with a “Preset” name.




Tap on the name of the button and you will be able to change it by using the virtual keyboard of your device. Press ENTER button to confirm the new name.

**NOTE**

When you save the focus position in the Virtual HandPad, you will find the same positions when you will control the ESATTO with USB from your EAGLE or external computer.



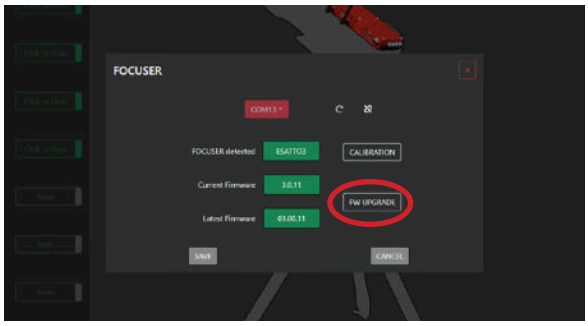

By pressing the top-left button in the Virtual HandPad main screen, the option menu will appear. Here you will be able to set:

1) *LED dimming*: you can change the ESATTO LED lights intensity to the value you prefer. LED status will be automatically stored in the ESATTO electronics.

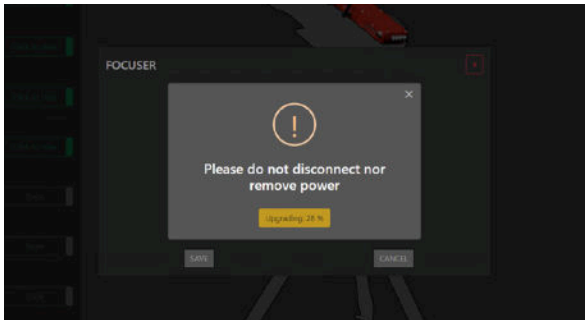
2) *ARCO enable*: this switcher allows you to activate the optional ARCO rotator (that has to be connected to ESATTO with the ARCO cable).

3) *Calibration*: every ESATTO unit is pre calibrated in our factory but, in case you want to redo the calibration, by pressing this button you will re calibrate ESATTO again.

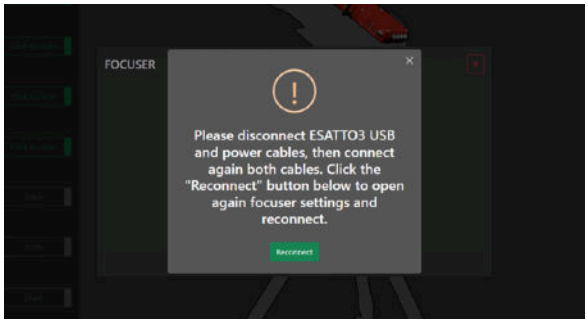
# Update ESATTO firmware with PLAY software



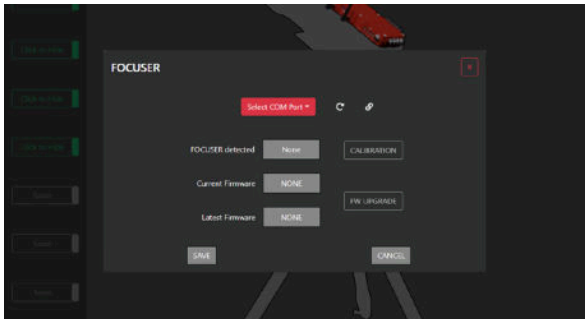

In order to update the ESATTO firmware, first of all please check you're using the latest version of PLAY (if you find a new version available to download on our website, please uninstall the older version of the PLAY and then install the latest PLAY version). Start PLAY and connect to ESATTO focuser. The "Current Firmware" shows the actual firmware version you're using in your ESATTO. The "Latest Firmware" shows the latest ESATTO firmware available. If there is a "Latest Firmware" newer than the "Current Firmware" please click the "**FW UPDATE**" button to start the update procedure.




The process will start updating ESATTO firmware. Please do not disconnect USB or power cable until the process is completed.




At the end of the update procedure, please disconnect ESATTO USB and power cables, then connect again power and USB cable to your computer. Click the "**Reconnect**" button.




This will open again the FOCUSER settings window. Here please select the COM port of your ESATTO focuser and click on the connect icon to reconnect.

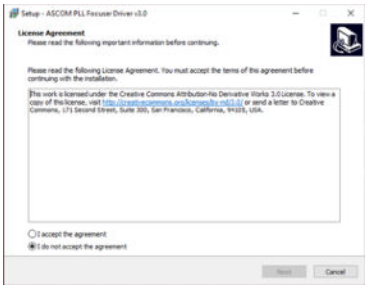
# Control ESATTO with ASCOM drivers and third party softwares

In order to control your telescope focus with ESATTO you can also use third party softwares instead of the PLAY described in the previous paragraphs. In order to do this, you can use ESATTO ASCOM drivers. **NOTE: the "PLL ASCOM Focuser" drivers described in this manual are version 3 and they require the use of firmware 3 in the ESATTO.**

**NOTE**

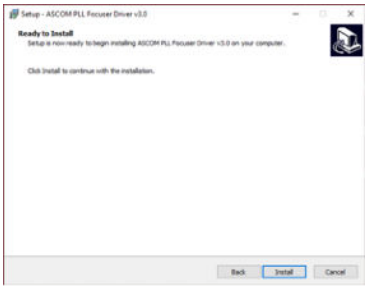
ASCOM is an open platform that allows an integration between astronomy softwares and devices. In order to use ESATTO with ASCOM drivers, first all you have to download the ASCOM platform (from https://ascom-standards.org website, ESATTO has been tested with ASCOM platform 7) and install it in the Windows computer you use to control ESATTO.

In order to install ESATTO ASCOM driver in the EAGLE or Windows computer you use to control ESATTO, please follow these steps:

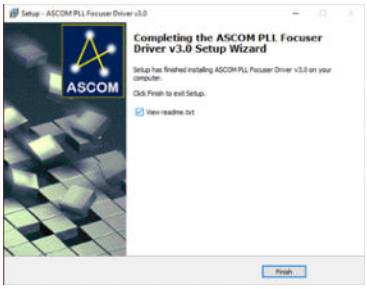


Make a double click on the **PLL ASCOM Focuser.exe** file that is part of the ESATTO software package you downloaded from our website.

A new window will appear, select "I accept the agreement" and press **Next** button to proceed.



In the next window, press the **Install** button to proceed with installation.



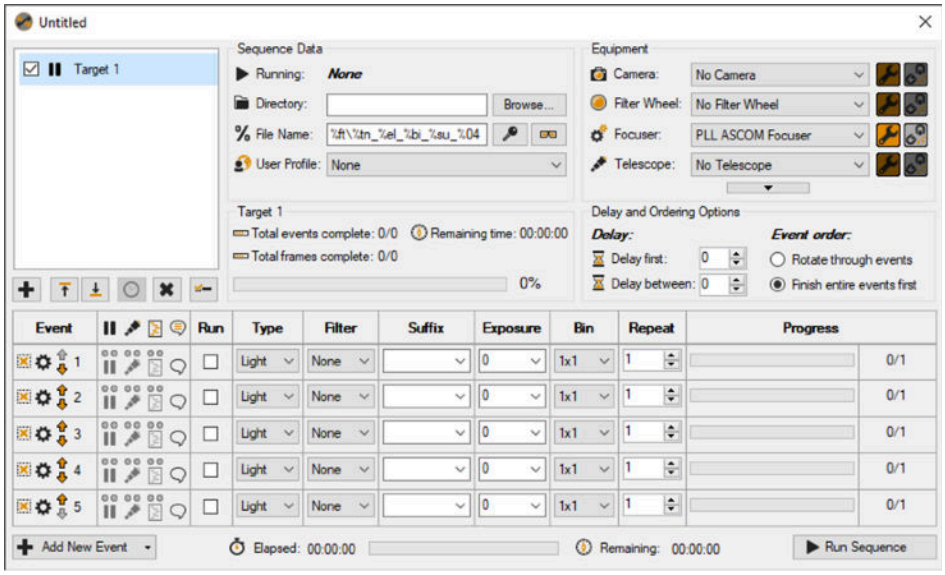

When the installation is completed, press the **Finish** button

**NOTE**

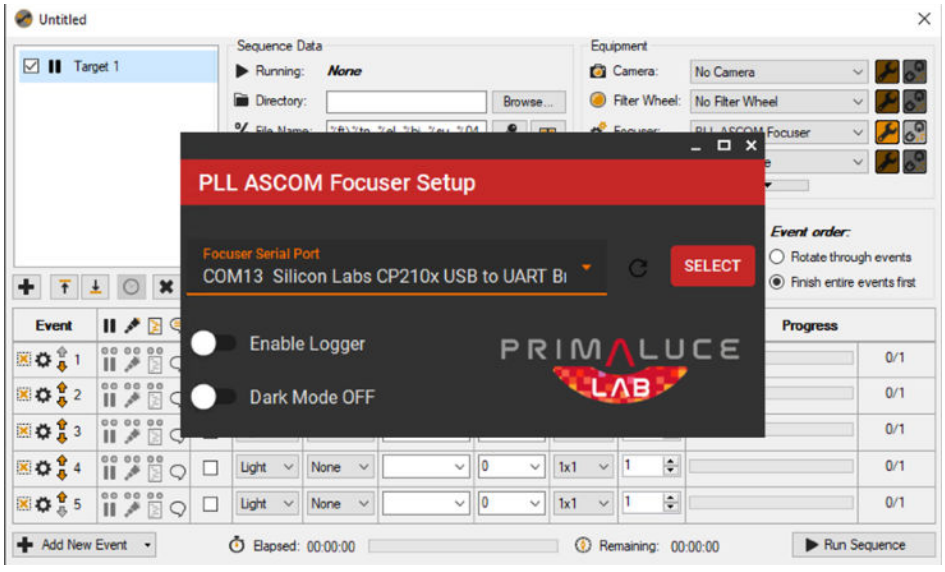
The ESATTO ASCOM driver included a log file record feature that allows your computer to save a file with all the events related to the use of ESATTO with ASCOM and third party software. If you find any problem with your astrophotography software, enable the "Log communication" option in the ESATTO ASCOM properties and send us with en email to support@primalucelab.com the log files you will find under C:/Documents/ASCOM

Now you can use and control ESATTO robotic focuser by using third party softwares for Windows and that supports ASCOM platform. In this guide we'll show two examples with 3 softwares commonly used in astrophotography:

1) ***Sequence Generator Pro***: http://mainsequencesoftware.com

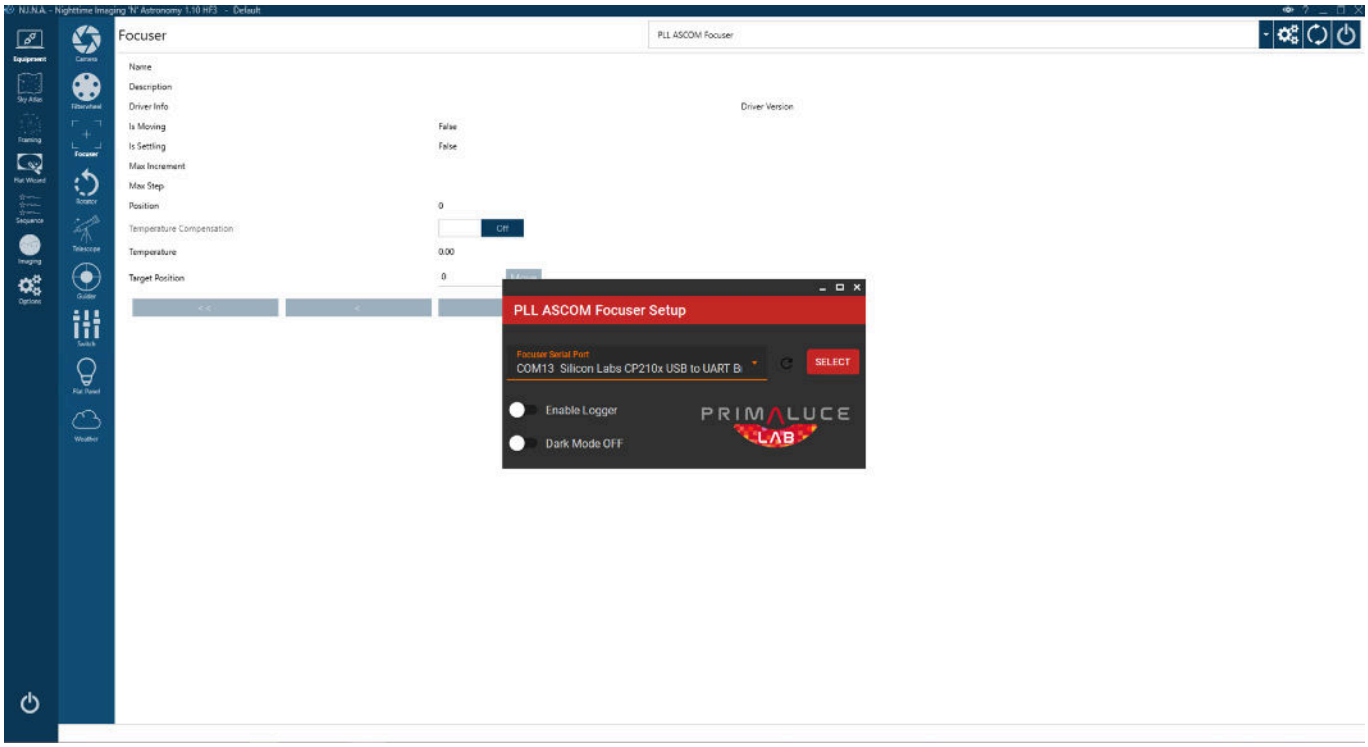



Start Sequence Generator Pro and, in the Equipment profiler, select "**PLL ASCOM Focuser**" then click on the first icon to the right. This will open a new window asking for the COM port number. Select the COM port related to ESATTO and press the **SELECT** button.

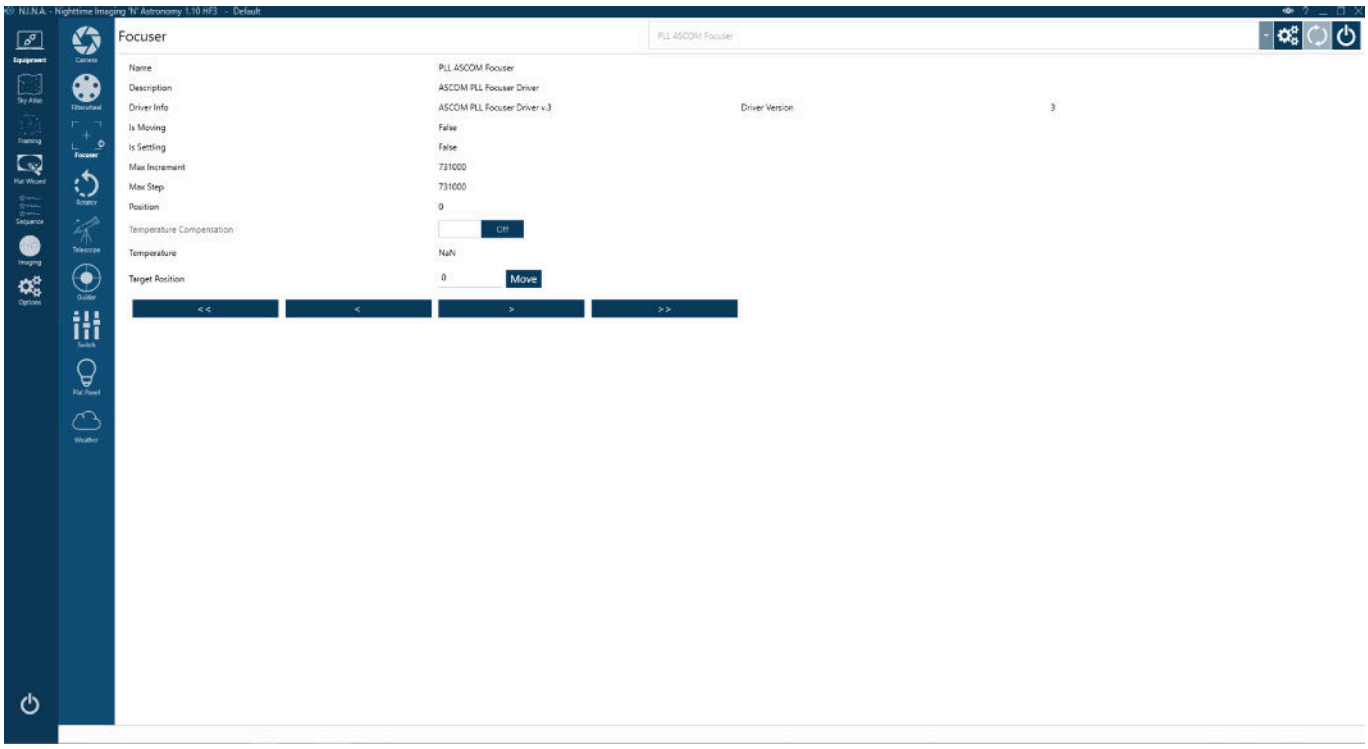



This will start the connection to the ESATTO and you will see position, temperature (if you connect the optional temperature probe) and movement buttons in the "Focus Control" tab.

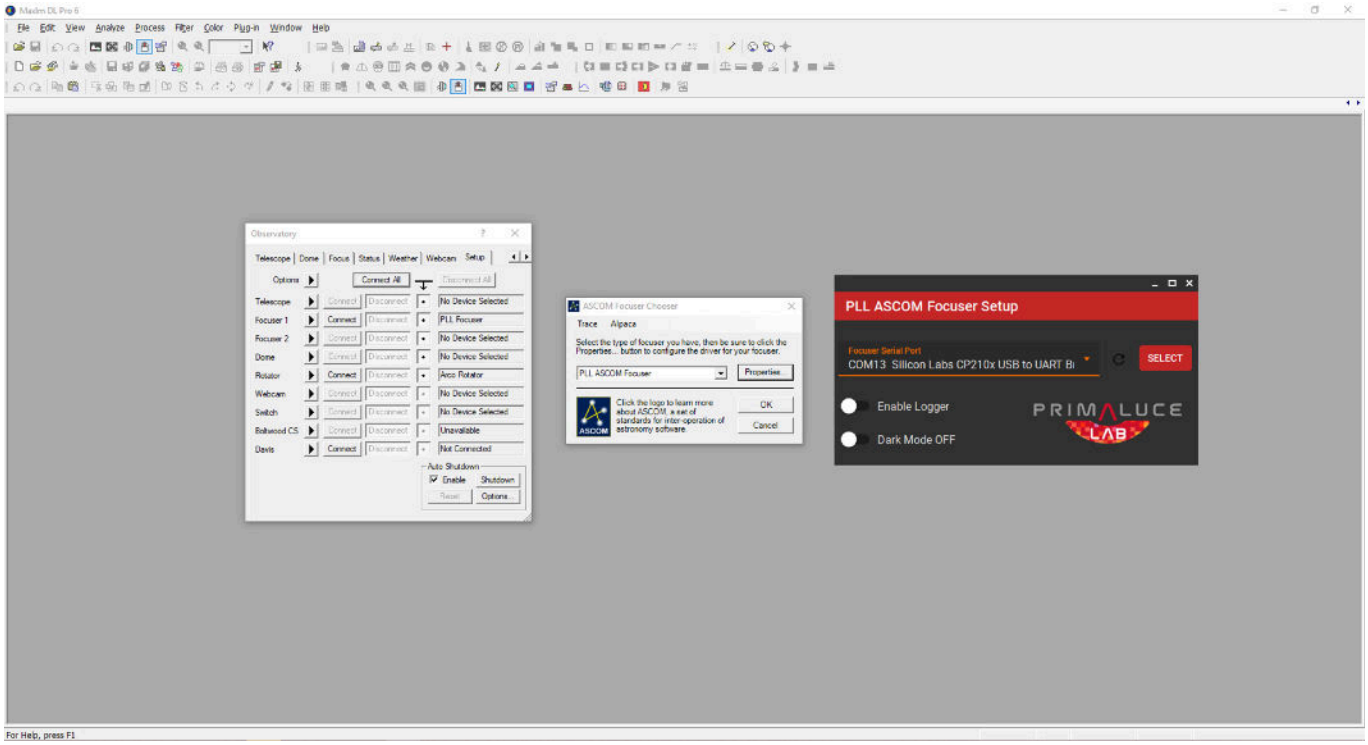
2) ***N.I.N.A.***: https://nighttime-imaging.eu




Select the "**Equipment**" tab, select "PLL ASCOM Focuser" then click and click on the button to the right of the "Focuser" area. This will open a new window asking for the COM port number. Select the COM port related to ESATTO and press the **SELECT** button. Finally, press the connect icon in N.I.N.A. to start the connection to the ESATTO and you will see position and temperature (if you connect the optional temperature probe).



3) ***MaximDL***: http://diffractionlimited.com/product/maxim-dl/



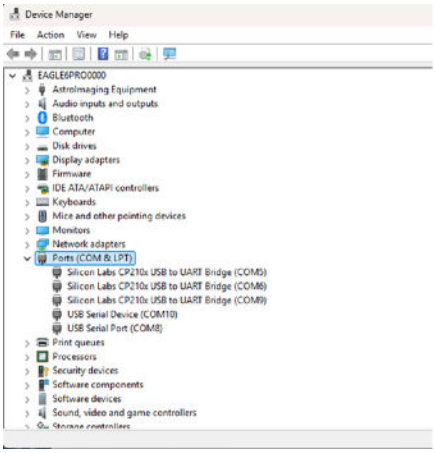

Select “**Observatory**”, click on the ▸ button to the right of “**Focuser**” and select “**Choose**”. In the new window select “***PLL ASCOM Driver***” and click on “**Properties**”. This will open a new window asking for the COM port number. Select the COM port related to ESATTO and press the **SELECT** button and then press OK button in the “ASCOM Focuser Chooser" window. Finally, press the “**Connect”** button in the Observatory window to start the connection to the ESATTO.

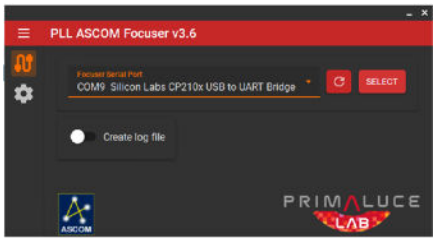
# Using ESATTO with NINA

*(this guide has been written with the collaboration of Ronald Brecher - https://astrodoc.ca/)*

N.I.N.A. (Nighttime Imaging 'N' Astronomy - nighttime-imaging.eu) is a powerful, free, open-source astrophotography suite known for its broad ASCOM hardware compatibility, advanced automation, and deep customization, making it ideal for users who want full control of complex imaging sessions but are comfortable with a steeper learning curve. N.I.N.A. is easy to install, it excels in flexibility, and it supports a very wide range of equipment and options. It works with all PrimaLuceLab equipment, and it is one of the most used astrophotography softwares among advanced users. in this paragraph you will find the main steps for controlling your ESATTO with N.I.N.A.

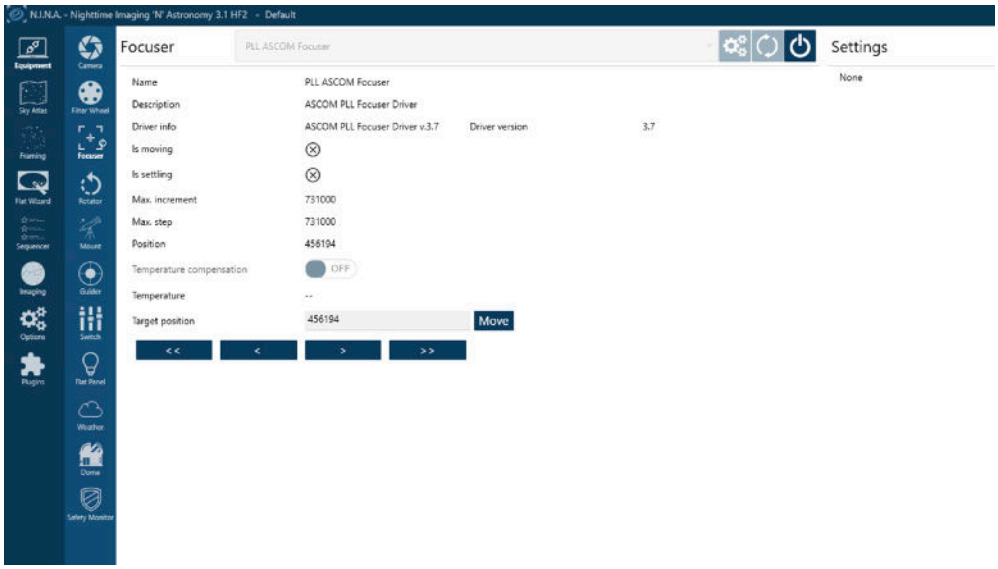
## Connecting ESATTO to N.I.N.A




1. Install the latest stable version of N.I.N.A. from the link above. Setup your ESATTO as directed in the user manual.
2. Disconnect the ESATTO USB cable from the EAGLE or other PC.
3. Click the Windows Start button and begin typing 'Device Manager.' When you see the Device Manager, launch it and expand the PORTS section.
4. Connect your ESATTO via USB and take note of which COM port appears in the device manager. Jot it down as you will need it later.
5. In N.I.N.A., go to the Equipment tab and select Focuser.
6. Choose the 'PLL Focuser vx.x (ASCOM)' from the drop-down list.
7. Click on the gear icon and the ASCOM settings window will open. From the dropdown list choose the COM port to the one you wrote down in step 4 and press SELECT.
8. Click the Connect button for the focuser.

Once N.I.N.A. connects to the focuser, information about the focuser will be displayed. Next, verify that N.I.N.A. can control the focuser. Use the focuser controls on the Focuser tab to verify that the ESATTO moves in and out as expected.



### Note: erratic autofocus movements with direct ASCOM connection

In some configurations, when a third party software (like NINA) is connected directly to the "PLL Focuser (ASCOM)" driver, the autofocus routine may show irregular step movements with position reporting that may diverge from the real movement. This can be related to very frequent requests third party software sends to the driver during the autofocus routine. If you notice this behavior, we suggest connecting the focuser through the ASCOM Device Hub instead of selecting the PLL driver directly. Select "Device Hub Focuser" from the focuser list, then open the Device Hub settings and select the "PLL Focuser (ASCOM)" driver inside it. The Device Hub acts as a buffer between the software and the driver, and this restores regular and precise movements during autofocus.

### Troubleshooting Your Connection

You'll get an error message if ESATTO fails to connect to your PC. The most common causes of failure to connect are no power, no USB connection, or wrong COM port selected during setup.

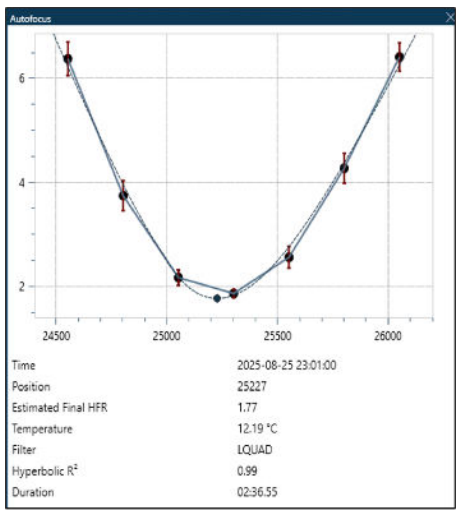
1. Ensure that focuser is connected to power (red power light indicates power).
2. Ensure USB is connecting. With Windows Device Manager open and the PORTS section expanded, confirm that the focuser connection appears and disappears when you plug in and unplug the USB cable. Write down the COM port number for the next step.
3. Ensure you have selected the correct COM port In N.I.N.A. In the Equipment tab, select the Focuser tab. Highlight the PLL ASCOM driver, and click on the gear icon. Make sure that the COM port matches the COM port that appeared in Device Manager in the preceding step.

### Setting Up Autofocus

Before you can use the triggers and instructions, you'll need to set up Autofocus for your imaging system. Two of the most important parameters for reliable autofocusing are the Autofocus Initial Offset Steps and the Autofocus Step Size. Autofocus Initial Offset Steps should be set at 3 or 4. The Autofocus Step Size is specific to your system. To determine a good starting point for the Autofocus Step Size, begin by focusing the telescope using a Bahtinov mask. Remove the Bahtinov mask and note the position of the focuser. Then, zoom in to see the stars well, and begin looping short (1-2s) exposures.

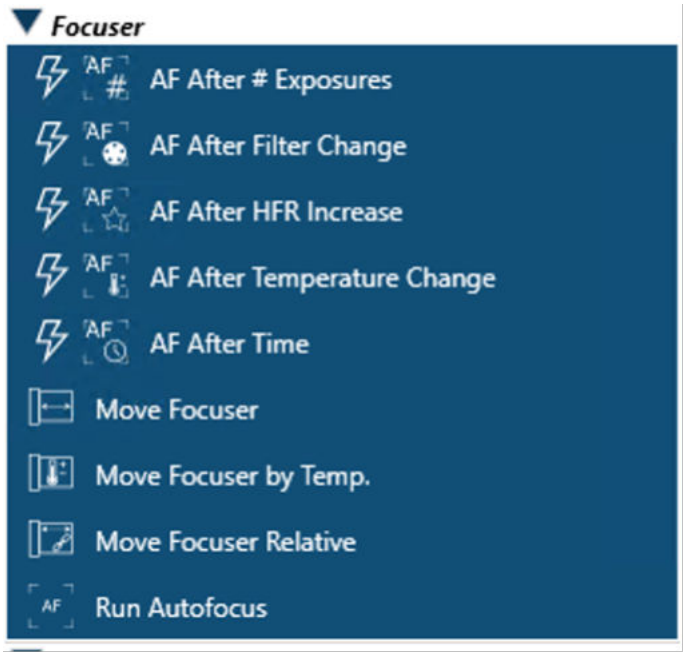



Move the focuser position out far enough that you can see that the stars are very slightly out of focus. Note the focus position. Use the difference between focused and unfocused positions as your Autofocus Step Size. For ESATTO, try an Autofocus Step Size of 5000. Suggested starting values for other parameters are shown in the figure, but they should be optimized for your system by experimenting.




A successful autofocus run looks like a 'V' and the shape of the autofocus curve is sometimes called a V-curve. Please see the detailed instructions from N.I.N.A. on optimizing autofocus parameters. Most parameters on the Autofocus Options tab have tool tips that appear when you hover over them.

### Triggers and Instructions for ESATTO




Triggers are conditional instructions that are executed only if a condition is true. They appear with a lighting bolt icon in the Instructions pane of the Sequencer tab. Triggers are evaluated after every exposure. There are five focuser triggers:

- autofocus after # exposures
- autofocus after filter change
- autofocus after HFR (i.e. star size) increase
- autofocus after temperature change
- autofocus after time

Triggers make it convenient to periodically autofocus only when needed, depending on your system and imaging environment. For example, Autofocus After Temperature Change checks the temperature after each exposure. Once it has fallen by the specified amount, an autofocus is performed. For example, if it is set to 3C, an autofocus is triggered only when the temperature has fallen 3C since the time of the last autofocus. You can use more than one autofocus trigger in the same imaging sequence. For example, you may wish to focus once every hour and after a filter change, or you may want to focus whenever the average size of stars has increased by 5%.

There are also four focuser instructions that can be placed anywhere in a sequence.

- Move Focuser
- Move Focuser by Temp.
- Move Focuser Relative
- Run Autofocus

The Move Focuser command will move to the specified focus position. The Move Focuser Relative command will move the specified number of steps in or out. The Move Focuser by Temp instruction can be used to get an approximate initital focus, based upon the temperature, and to adjust focus periodically as the temperature changes during an imaging run. To use this instruction, you will need to establish the relationship between focus position and temperature. This will require a temperature probe connected to the ESATTO so that it reports temperature along with focus position. There is a plugin for N.I.N.A. called Autofocus Report Analysis that can be used to determine the best values to use for the Move Focuser by Temp instruction. Run Autofocus can be inserted anywhere in a sequence to autofocus using the settings established in Options/Autofocus.

Tables 1 and 2 summarize the autofocus triggers and instructions, respectively.

### Additional Resources

See the N.I.N.A. Plugins tab for many useful plugins that can be used with various equipment. Check regularly for additions and updates.

Detailed documentation for N.I.N.A. is available at https://nighttime-imaging.eu/docs/master/site/

An introduction to N.I.N.A. is available in Sky & Telescope, September 2023, p. 28-33

**Table 1: Summary of N.I.N.A. Focuser Triggers**

| Autofocus after… | Use it to focus … | Benefit |
|---|---|---|
| Number of exposures | At regular intervals | Maintains good focus through changing conditions |
| Filter Change | When a filter is changed | Accounts for slight differences in focus of different filters |
| HFR (star size) increase | As focus worsens over time | Maintains good focus through changing conditions |
| Temperature Change | After temperature changes by a specified amount | Maintains focus as temperature changes |
| Time | At regular intervals | Maintains good focus through changing conditions |

**Table 2: Summary of N.I.N.A. Focuser instructions**

| Focuser Instruction | Use it to … | Example of Use |
|---|---|---|
| Move Focuser | Move the focuser in or out to a specified absolute position | Set approximate focus position prior to Autofocus |
| Move Focuser by Temp. | Move the focus position by an an amount that depends on the temperature change since the last Autofocus | Place in between Take Image commands to automatically move the focuser as temperature changes |
| Move Focuser Relative | Move the focuser in or out by the specified amount from its current position | Set approximate focus position prior to Autofocus |
| Run Autofocus | Execute N.I.N.A. autofocus routine | Establish focus at the beginning of an imaging session. |
| Time | At regular intervals | Maintains good focus through changing conditions |

# Application example: ESATTO with Schmidt-Cassegrain and EdgeHD telescopes

Schmidt-Cassegrains and EdgeHD are great instruments because they combine high performance with ease of use (for example, they are simple to collimate) and portability (they are among the most compact optical tubes, although the diameter can also be large). However, the internal focuser of these telescopes (which allows focusing by moving the primary mirror) generates image shift and mirror flop problems that we can now avoid thanks to ESATTO.

### *Problems caused by internal focuser of Schmidt-Cassegrain or EdgeHD telescopes*

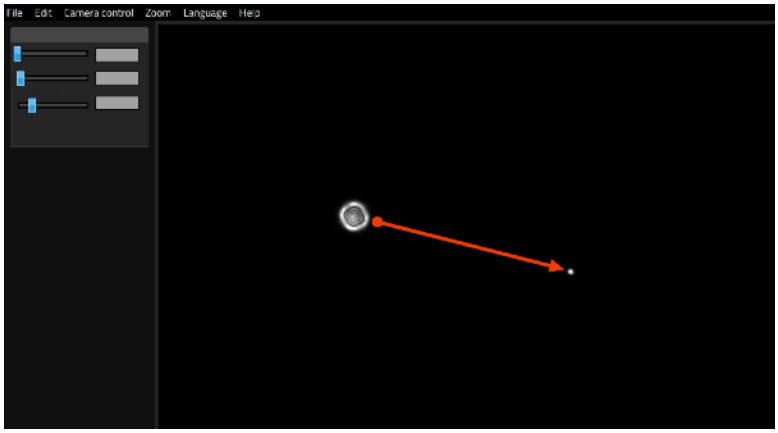



Image shift is generated when the focus with the internal focuser generates a displacement of the image: this problem is evident during high-magnification astrophotography of planets and the Moon when recovered object can even be moved out of the sensor field of view. By using ESATTO as focuser for Schmidt-Cassegrain or EdgeHD, we can avoid the image shift since we focus with the external focuser (and no longer using the internal stock focuser). Since ESATTO has a precision micrometric control with a 0.04 micron resolution, we can also focus with much greater precision than you have with standard manual focusing, without introducing vibrations during focusing (since we don't touch the telescope to focus but we control ESATTO with a USB connection from EAGLE or an external Windows computer or through the Virtual HandPad with WiFi connection from smartphone or tablet).

Mirror flop is the displacement of the primary mirror which tends to move due to its own weight and it's a problem for long-exposure astrophotography of deep-sky objects. This problem was fixed by Celestron EdgeHD telescopes which introduced an integrated primary mirror locking system. Unfortunately this also prevents focusing between expositions (that is commonly done when doing long-exposure astrophotography, for example when changing filters) and is therefore a problem also for the remote control of the telescope. Instead, by using ESATTO as focuser for Schmidt-Cassegrain or EdgeHD, we can use the primary mirror locking system (in telescopes equipped with this system) and perform micrometric focusing using ESATTO. This way Schmidt-Cassegrain telescopes and, especially, Celestron EdgeHD become ideal instruments also for remote control!

### *Connect ESATTO to Schmidt-Cassegrain or EdgeHD telescopes*

ESATTO is available in different diameters but, if you want to use it as focuser for Schmidt-Cassegrain or EdgeHD, we recommend the 2" model since it has the lower thickness (as we will see later it avoids back focus problems) and it already has of a larger free aperture (51mm) than the diameter of the baffle tube of these telescopes. As focuser for Schmidt-Cassegrain or EdgeHD, it is therefore not necessary to use ESATTO 3". Removing the visual back of Schmidt-Cassegrain or EdgeHD telescopes, you will find a thread that can be:

1) Standard SC thread, 50mm diameter, present in Schmidt-Cassegrain Celestron 8" and 9.25" telescopes and in EdgeHD 8". In order to connect ESATTO 2" to these telescopes you have to use the "Adapter ESATTO 2" for telescopes with SC thread" PL3600209
2) Large 3,3" SC thread: 84mm diameter, present in Schmidt-Cassegrain Celestron 11" and 14" and in the EdgeHD 9.25", 11" and 14". In order to connect ESATTO 2" to these telescopes you have to use the "Adapter ESATTO 2" for telescopes with large 3.3" SC thread" PL3600212



*ESATTO focuser for Schmidt-Cassegrain and EdgeHD: to the left a C8 telescope with SC thread, to the right a EdgeHD 9.25" telescope with 3,3" thread.*

Then, using one of the various M56 adapters with Stop ring you can directly connect the cameras (or other photographic accessories) with T2, M48, SC, M54 and M57 thread to ESATTO 2" or you can use the "2" visual back for ESATTO 2" PL8410001 to connect to ESATTO any instrument with a 2" nose. The 2" visual back has the advantage of being universal, while the M56 adapters with stop rings allow you to directly screw accessories or cameras to ESATTO draw tube (and lock it at a perfect angle thanks to the stop ring) so they are perfect for astrophotography since they avoid any flexure.

***Application example: how to use ESATTO 2" with Schmidt-Cassegrain telescopes***

When you use ESATTO as focuser for Schmidt-Cassegrain, you can make a fast focus by using the telescope's internal focuser and then achieve perfect focus using ESATTO. This allows you to easily switch between the visual use (usually with a mirror diagonal and eyepieces) and the photographic one (by connecting planetary, DSLR/mirrorless cameras or cooled CCD/CMOS cameras to ESATTO) since you will need a lot of focus travel for this switch. If you want to use the f/6.3 focal reducer for your Schmidt-Cassegrain telescope, just use the "Adapter from M56 to SC with stop ring for ESATTO 2" PL3600225 which will allow you to screw the focal reducer directly to ESATTO. Then, using a standard photo adapter, you can connect your camera to the focal reducer with the correct backfocus distance (that for Celestron f/6.3 focal reducer is 105mm).




*ESATTO focuser for Schmidt-Cassegrain and EdgeHD: ESATTO 2" connected to C8 telescope. The f/6.3 focal reducer is directly threaded to ESATTO thanks to PL3600225 adapter.*

***Application example: how to use ESATTO 2" with EdgeHD telescopes***

EdgeHD telescopes have an integrated corrector and, for the correct use in astrophotography, it is necessary to connect the camera by setting the sensor to corrector/reducer distance (backfocus) to the correct value. For example, the EdgeHD 9.25 ", 11" and 14 "require to position the sensor at 146mm from the rear thread, with or without the focal reducer (for the EdgeHD 8" this distance is 133mm without focal reducer and 105mm with reducer). ESATTO 2" with the PL3600212 adapter and an M56 adapter with stop ring is 73mm thickness so we still have 73mm (146 - 73 = 73) that enough to connect cooled cameras also with different accessories for astrophotography (such as off-axis guides or filter wheels) and/or DSLR/mirrorless cameras .




*ESATTO focuser for Schmidt-Cassegrain and EdgeHD: ESATTO 2" connected to EdgeHD 9.25 with focal reducer.*

Since ESATTO 2" is installed after the corrector or after the focal reducer, it can also be used to perfectly set the backfocus distance using the 15mm draw tube travel (thus obtaining the best performance from the telescope). In order to do this, just follow these steps:

1) Adjust the backfocus distance from the corrector or reducer to the camera sensor: in the example of the EdgeHD 9.25" telescope with focal reducer in the photo above, since we still have 73mm of backfocus and since the sensor of a DSLR camera is 55mm away from the front T2 thread (by connecting a T2 ring to the camera body), we will still have 18mm distance, so we used a 10mm T2 extension (screwed in front of the camera) and we will use 8mm of focus travel to bring the camera sensor perfectly at 146mm distance from the reducer. Note: using the saved positions of the Virtual HandPad you can also save the ESATTO position that brings the sensor to the perfect backfocus distance and recall it on the following nights!
2) Point the telescope to the stars and focus with the internal focuser: this way we will find the focus point without changing the rear backfocus and therefore we will obtain the ideal optical configuration that allows the telescope to work with the best performance.
3) Close the locking knobs of the EdgeHD primary mirror: this will avoid problems associated with mirror flop.

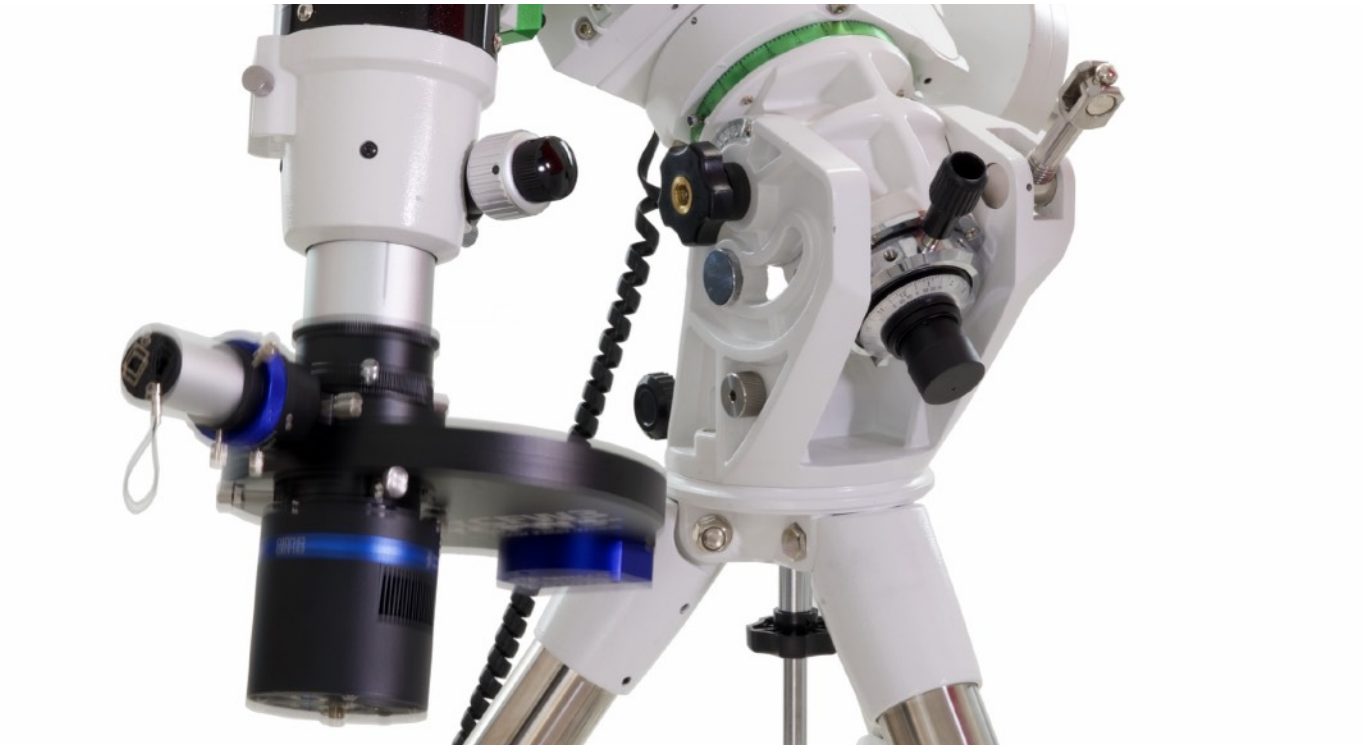
Celestron EdgeHD telescope is now ready to be used with the ESATTO focuser that you will use to adjust the focus varying the position of the camera only by fractions of a millimeter. These very small movements in fact do not affect the telescope's performance since the EdgeHD optics (with or without reducer) are designed to allow a certain tolerance (+ - 0.5mm) in the backfocus distance.

# Application example: ESATTO with refractor telescopes

Thanks to the many available adapters, you can easily use ESATTO as the new focuser for refractors and improve performance, especially in astrophotography. Refractors, and especially the apochromatic models, are perfect instruments for astrophotography since they haven't a very long focal length (you can use them for very long exposition times also with affordable mounts) and they combine very good performance with easy of use. But many refractors use a focuser that may not be able to adequately support your camera and the accessories used in astrophotography: let's see how you can improve your refractor telescope by replacing the focuser with ESATTO.

***Some of the problems you may have with standard focuser***

Astrophotography, especially the one aimed at deep-sky objects, requests not only for specialized cameras (usually with large sensors and with a cooling system) but also for many accessories like large motorized filter wheels. When you have such a large "imaging train", the first thing to consider is its weight: in fact most of the refractors (especially the ones with an affordable price) are not provided with the weight load capacity that is needed to perfectly keep the camera in the focus position during the long exposition times requested in astrophotography, especially when the telescope is pointed to the zenith (the vertical position). If your focuser has not enough weight load capacity, your camera and accessories will slip and will bring your sensor out of focus. But if we use ESATTO as focuser for refractors, we'll have a high weight load capacity and you will be able to use also heavy imaging trains.



*If the imaging train weight is higher than focuser's load capacity, the image train may slip during the imaging session.*

***How to use ESATTO as focuser for refractors***

ESATTO is available in different diameters and you have to choose the one that better fits your telescope based on your refractor specifications. If a compact refractor may use a standard 2" focuser, a larger refractor may need for the ESATTO 3". ESATTO is designed to be used as new focuser for refractors, by replacing your standard focuser. So you can remove the original focuser from the tube of your refractor and connect the ESATTO. In order to make this as easy and straightforward as possible, we designed different adapters: first of all you connect the adapter to the tube of your telescope and then you connect the ESATTO robotic microfocuser.



*PL3600230 adapter allows you to easily install ESATTO on the Skywatcher EVOSTAR 80 ED telescope.*

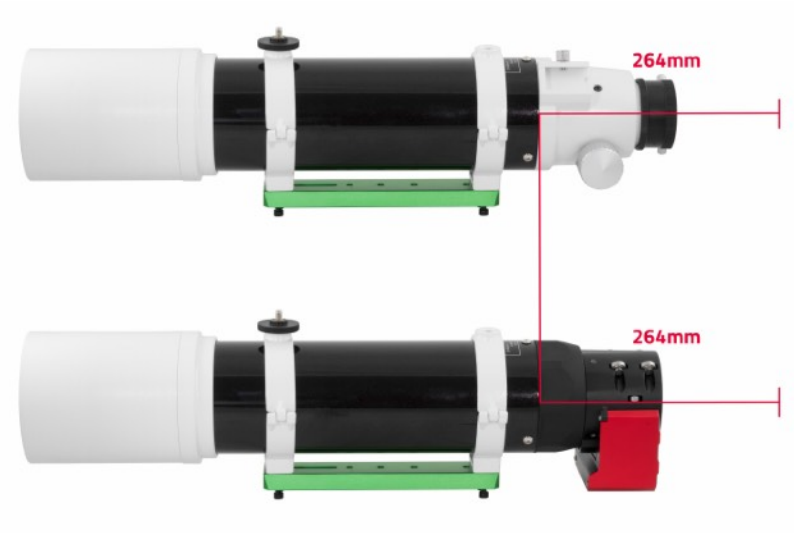
Please note, if your refractor telescope has a built in corrector (field flattener or reducer), in order to use ESATTO first of all you have to check if the corrector is inserted in the focuser's draw tube or if it's separated from it. If the corrector is built in in the draw tube, by removing the original focuser you will remove the corrector too and in this case you can't use the ESATTO. If your corrector is separated from the focuser (for example, like the Borg 90FL f3.9 and 107FL f3.9, the Takahashi FSQ85 or one of the many 65mm quadruplets available with different brand names), you can use the ESATTO as new focuser for refractor.



*iI the refractor's corrector (at the center in the image above) is separated from the standard focuser (right in the image above) you can use ESATTO.*

***Application example and focus position of your refractor***

Refractors usually have very long focuser's draw tube while the ESATTO is a microfocuser designed for the small and precise movements requested in astrophotography. So, if you remove a focuser with long draw tube and you connect the ESATTO, in order to reach the focus you may need one or more extension tubes to install after the ESATTO focuser. For example, we can consider the ED 80 refractor telescope by SkyWatcher (EVOSTAR 80 ED) or Orion (80 ED).




*When you focus on stars, SkyWatcher EVOSTAR 80 ED bring the sensor at 264mm distance from telescope tube.*

For this telescope we can use the 2" version of ESATTO and we designed a proper adapter (PL3600230) to connect it directly to the tube. By removing the 3 screws that fix the original focuser to the telescope tube, you can remove the original focuser (please note, sometimes manufacturers use thread lock so you may need to apply force to unscrew the locking screws), then install the PL3600230 adapter instead and finally connect ESATTO.



*ESATTO 2" installed on the SkyWatcher EVOSTAR 80 ED telescope instead of the standard focuser.*

The adapter thickness is designed to make the ESATTO with adapter thickness to be equal to the one of the original focuser, this way you will never have problems to reach focus in the focuser's draw tube inner position. But, while the original focuser has 75 mm draw tube travel, the ESATTO 2" has 15mm travel. Since, when you focus on the stars, your sensor will be at 264mm from the telescope tube, based on the different instruments that you use to make astrophotography, you may need to add one or more extensions in order to reach focus position with ESATTO. Now your refractor telescope is ready to be used with the ESATTO focuser and you will be able to use heavy cameras and accessories even for the most difficult deep-sky astrophotography.

# Application example: ESATTO with Ritchey-Chretien telescopes

ESATTO is the perfect focuser for Ritchey-Chretien telescopes, that are great instruments for deep-sky astrophotography at medium-long focal length. Ritchey-Chretien telescopes were, just a few years ago, very expensive but now, especially the models produced by GSO, are very affordable and allow any amateur astronomer to own and use a Ritchey-Chretien telescope. Unfortunately these telescopes comes standard with a focuser that has not the load capacity requested for the heavy cameras and accessories commonly used in deep-sky astrophotography: let's see how you can use ESATTO as a new and better focuser for Ritchey-Chretien.

### *The right adapter to use ESATTO as focuser for Ritchey-Chretien*

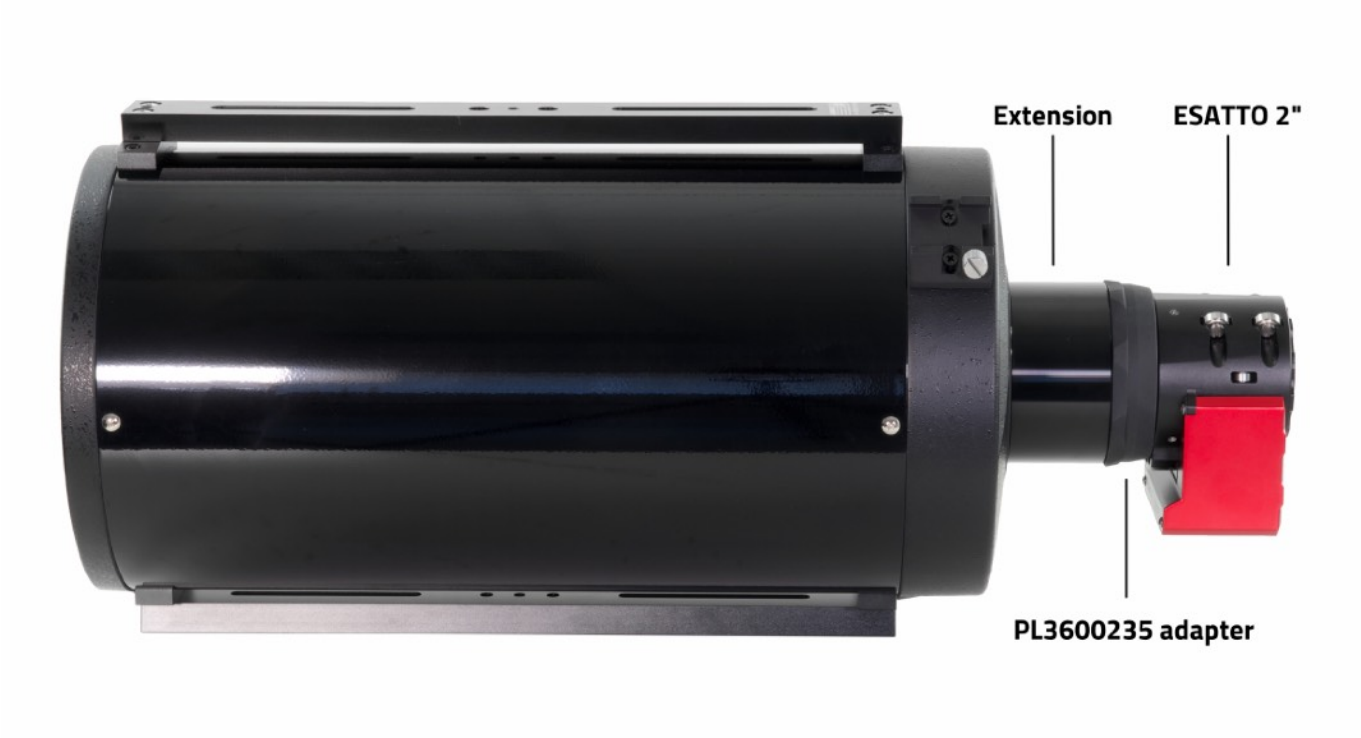
Ritchey-Chretien telescopes produced by GSO have 2 different threads in the rear part of the telescope and that you can find by removing the original focuser. A 90mm male thread on 6" and 8" models or a 117mm thread on larger 10", 12", 14" and 16" models. In order to use ESATTO as focuser for Ritchey-Chretien, we designed 2 adapters: the PL3600235 adapter allows you to use the ESATTO 2" on GSO Ritchey-Chretiens 6" and 8". The PL3600236 adapter allows you to use the ESATTO 3" on GSO Ritchey-Chretiens 10", 12", 14" and 16".



*ESATTO as focuser for Ritchey-Chretien telescopes: to the left the 90mm thread that you can find on GSO 6" or 8" Ritchey-Chretien telescopes. To the right, the 117mm thread that you can find on GSO 10", 12", 14" or 16" Ritchey-Chretien telescopes.*

### *ESATTO 2" on GSO Ritchey-Chretien 6" and 8”*

Ritchey-Chretien telescopes usually have a long back focus and the GSO models make no exception allowing to attach camera also many astrophotography accessories like e.g. off-axis guiders, filter wheels etc. In order to easily reach the focus position, usually you will need to use one or more extensions (provided with the telescope). Then, in order to use ESATTO 2", you connect the PL3600235 adapter and finally the ESATTO 2".




*ESATTO as focuser for Ritchey-Chretien telescopes: ESATTO 2" installed on the GSO RC 8"*

### *ESATTO 3" on GSO Ritchey-Chretien 10", 12", 14" and 16" (also truss)*

The larger diameter Ritchey-Chretien telescopes by GSO are available also with truss type tube and this guide is valid also for these configurations. In order to easily reach the focus position, usually you will need to use one or more extensions (provided with the telescope). Then, in order to use ESATTO 3" to the Ritchey-Chretien telescope, you connect the PL3600236 adapter and finally the ESATTO 3".




*ESATTO as focuser for Ritchey-Chretien telescopes: ESATTO 3" installed on the GSO RC 10"*

***Using Ritchey-Chretien correctors or reducers with ESATTO***

GSO Ritchey-Chretien telescopes offer also correctors and reducers in order to allow you to better adapt your telescope based on your imaging needs. Usually these correctors comes in a 2" diameter barrel that you can easily connect to the ESATTO by adding the 2" visual back: you need the PL8410001 visual back if you want to connect the corrector to the ESATTO 2" or the PL8410002 visual back if you want to connect the corrector to the ESATTO 3". Please note that every corrector is designed with a precise back focus distance (the distance from the corrector to the camera sensor) so, after the corrector, you will need the proper photo adapter based on your camera model and the accessories you may want to use.

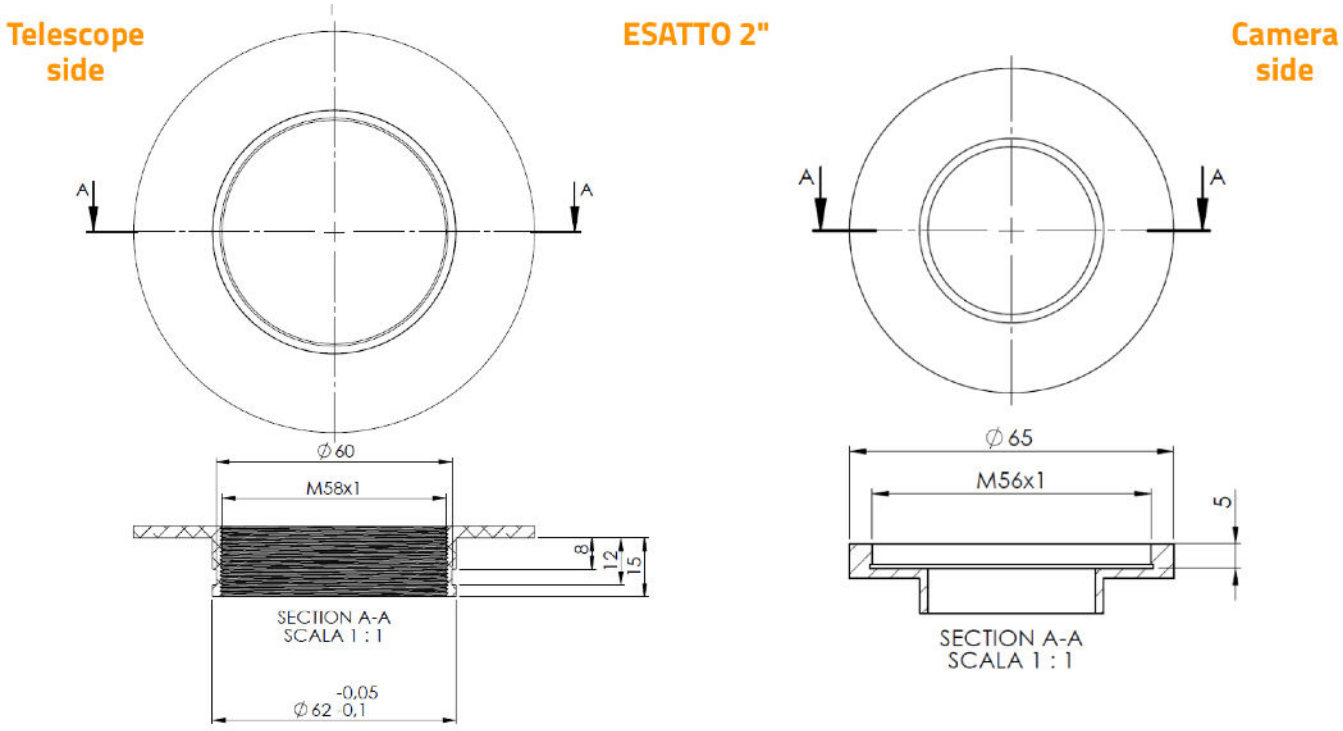


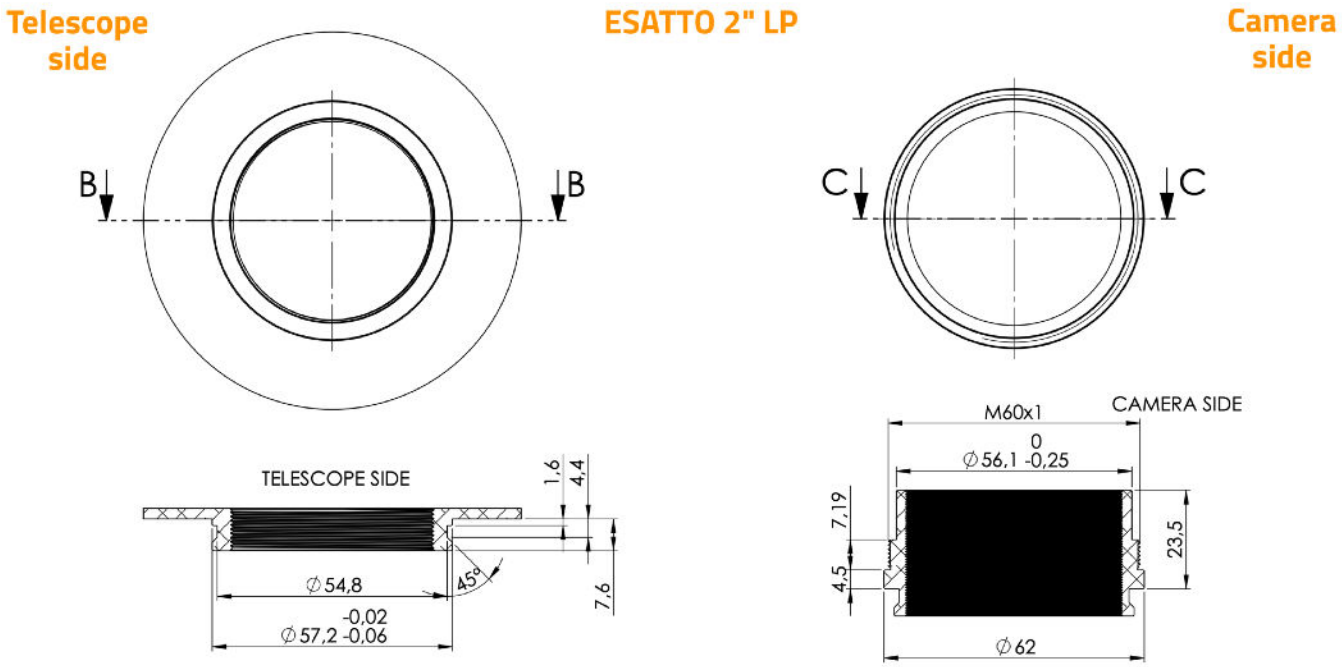

*ESATTO as focuser for Ritchey-Chretien telescopes: by adding the 2" visual back to the ESATTO, you can use the correctors for GSO Ritchey-Chretien telescopes*

GSO Ritchey-Chretien telescopes are now ready to be used with the ESATTO: this way you will have a better focuser with a very high load capacity (perfect also for heavy cameras and accessories for astrophotography), with a built in motor and electronics for remote control by connecting it to USB port of your EAGLE or external Windows computer of with WiFi by using the ESATTO Virtual HandPad.

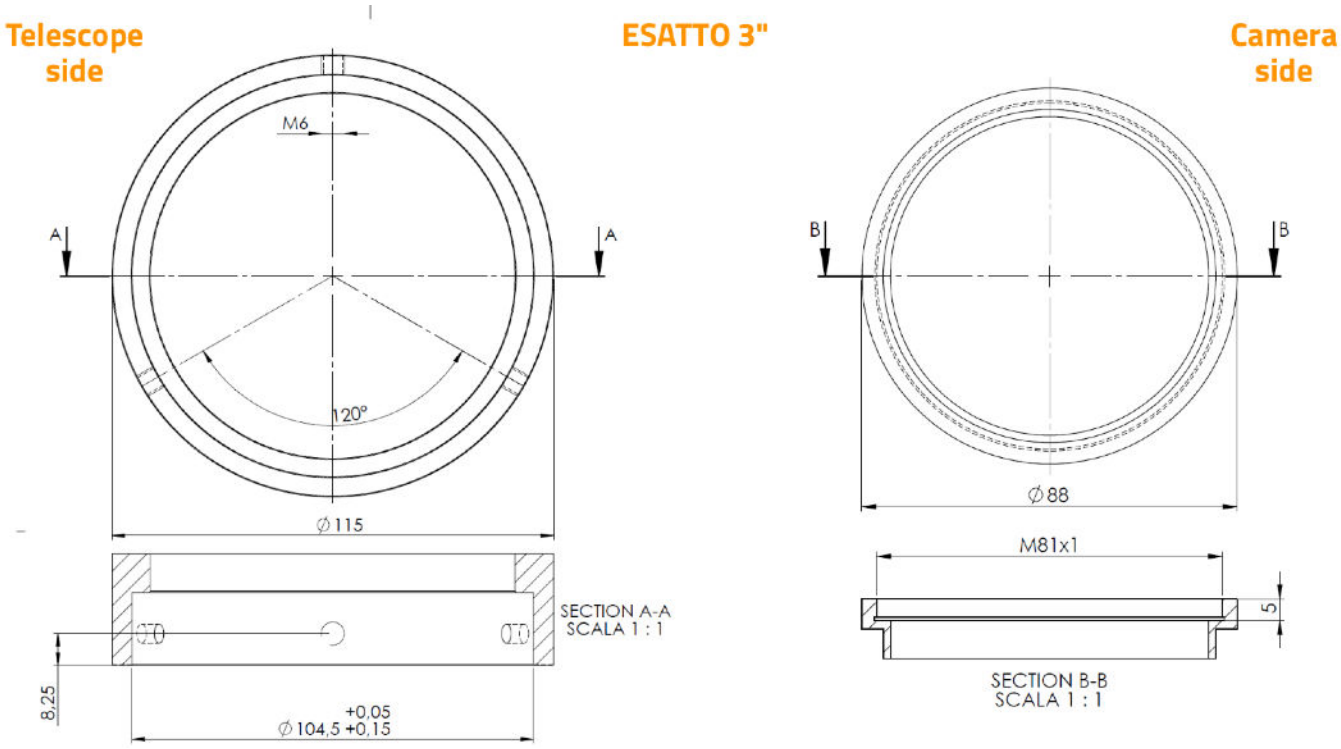
# ESATTO connection dimensions, telescope and camera side

If you want to build your custom adapter to connect ESATTO to your telescope or your accessory to one of the ESATTO focusers, here you have find the designs with measurements.

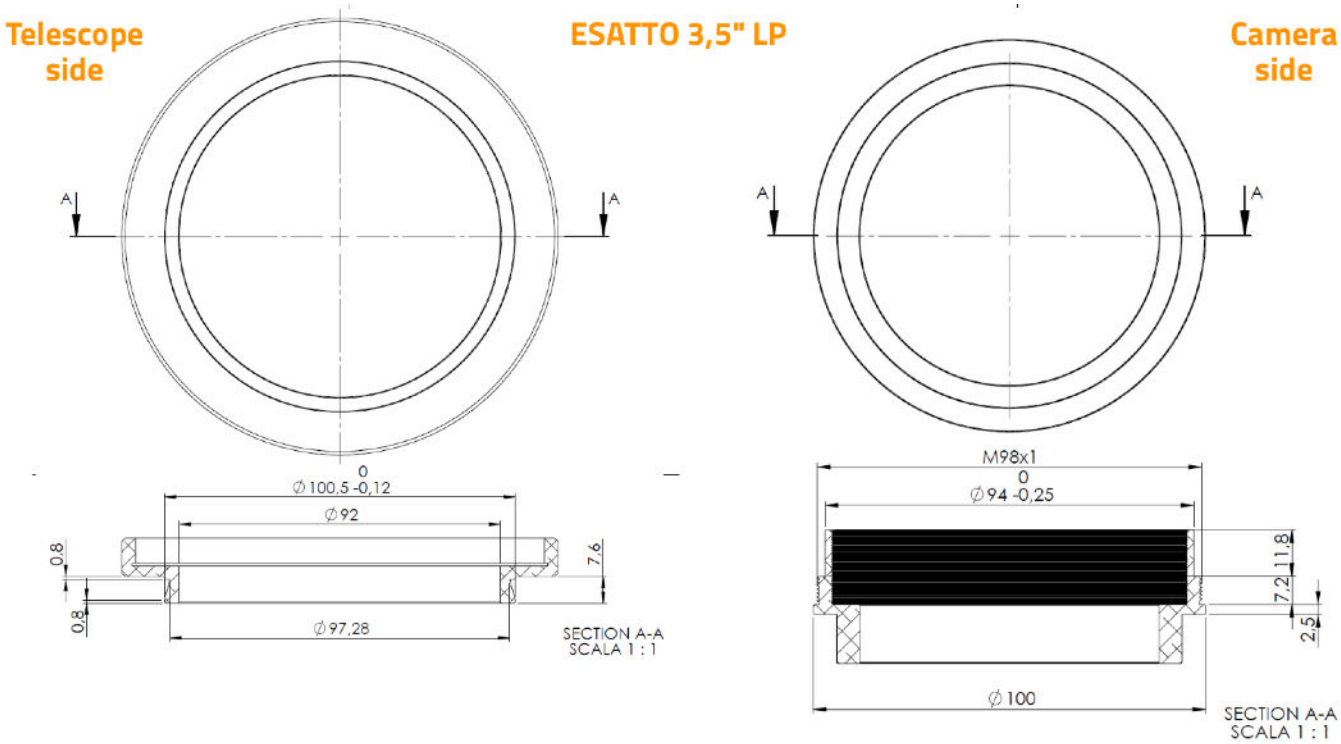


## ESATTO 3"



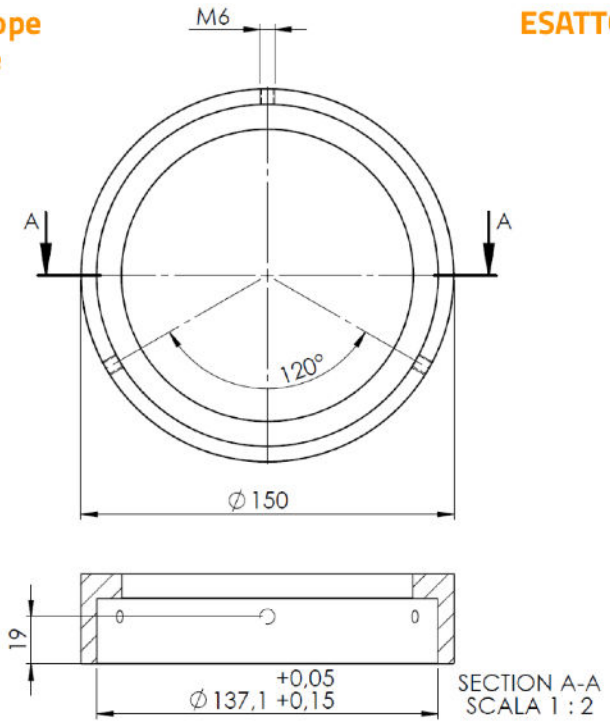

## ESATTO 3,5" LP

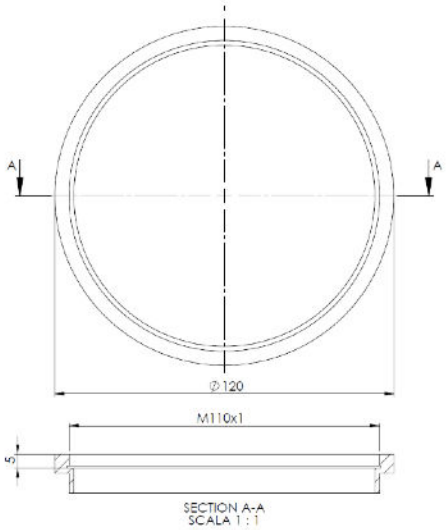


**Telescope side**

**ESATTO 4"**

**Camera side**

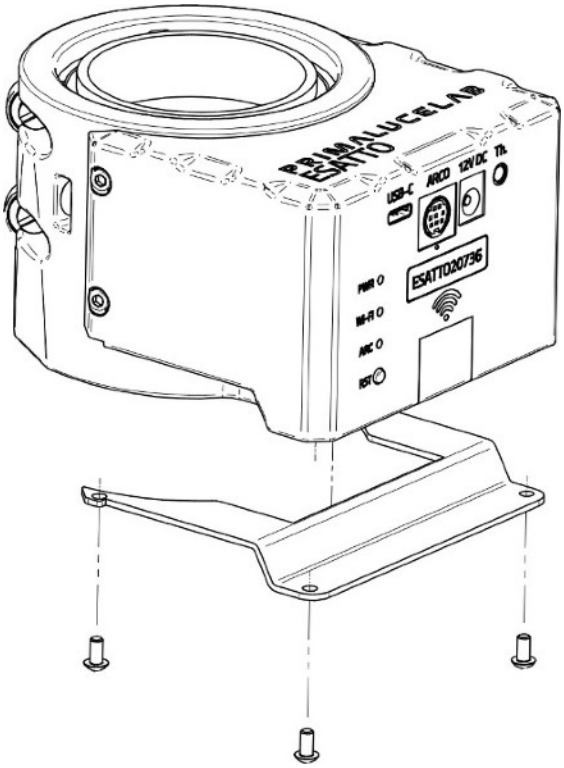


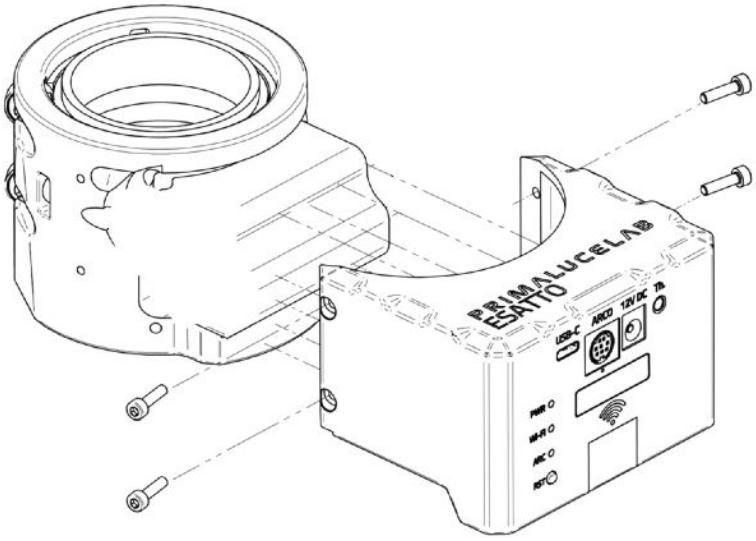
# ESATTO 2” registration procedure

To ensure optimal performance and precision, the ESATTO focuser allows users to fine-tune the pressure applied by the motorized shaft onto the draw tube. This operation, known as registration, may become necessary over time, for example due to mechanical wear or specific load requirements introduced by heavy imaging equipment. While the ESATTO is factory-set for ideal operation, customers can easily perform this adjustment themselves following the procedure described in this manual. However, it is important not to overtighten the adjustment screws, as excessive pressure may impair smooth movement or cause mechanical strain.

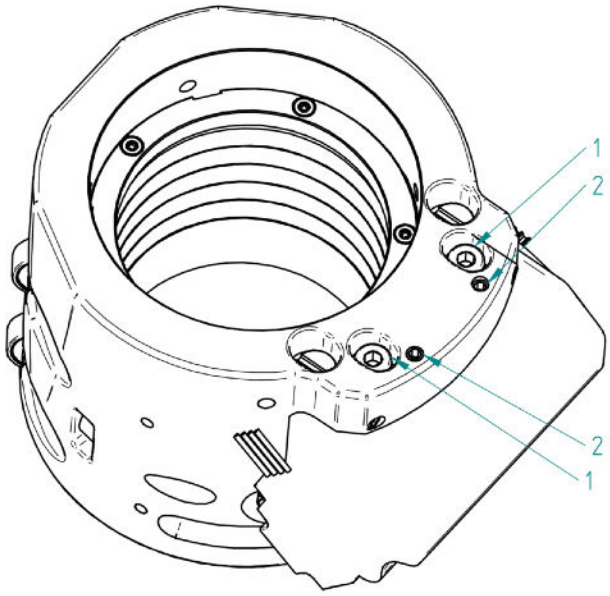
1. Remove the rear black cover: Begin by carefully removing the lower external cover of the ESATTO focuser.



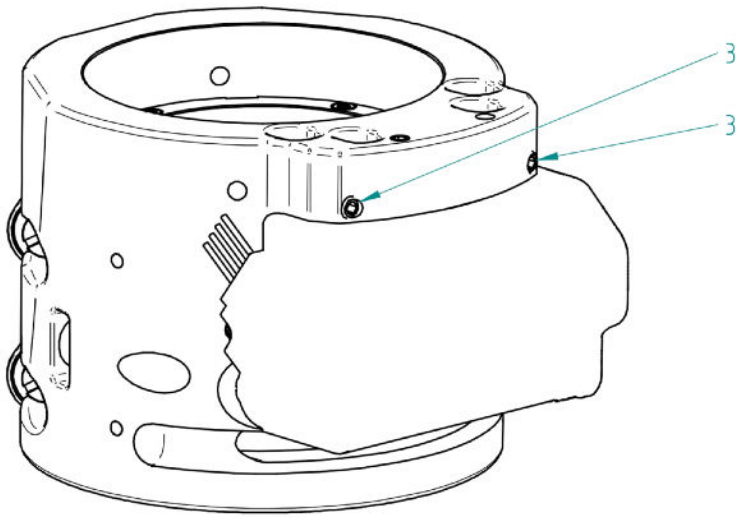

2. Remove the red cover: Unscrew the four screws securing the red cover and gently remove it to access the internal mechanism.



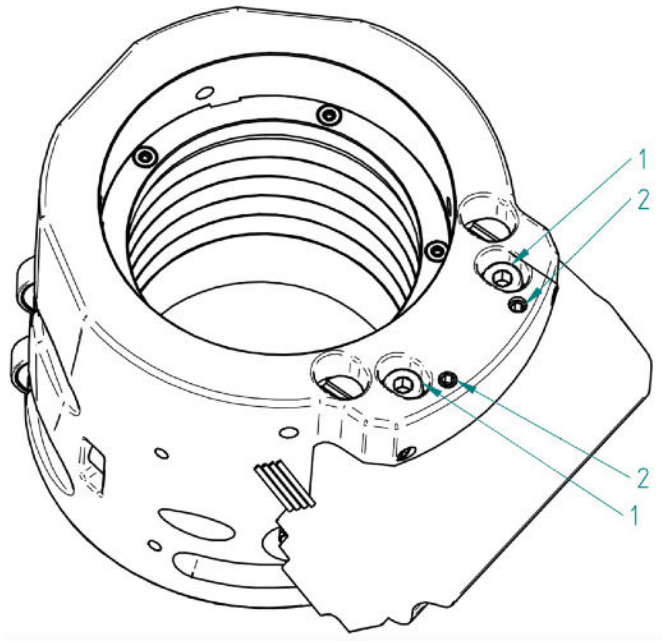
3. Slightly loosen screws 1 and 2: Identify and slightly loosen screws labeled as 1 and 2. These screws secure the assembly and need to be loosened to allow pressure adjustment.




4. Adjust the Pressure via Screws 3: Locate the two screws marked as 3. These are the adjustment screws that regulate the pressure of the shaft on the draw tube. Gradually tighten them to increase the pressure. Do not overtighten—apply just enough force to ensure smooth operation without causing resistance or mechanical strain.



5. Secure screws 1 and 2 again: Once the desired pressure has been set, re-tighten screws 1 and 2 to lock the adjustment in place.



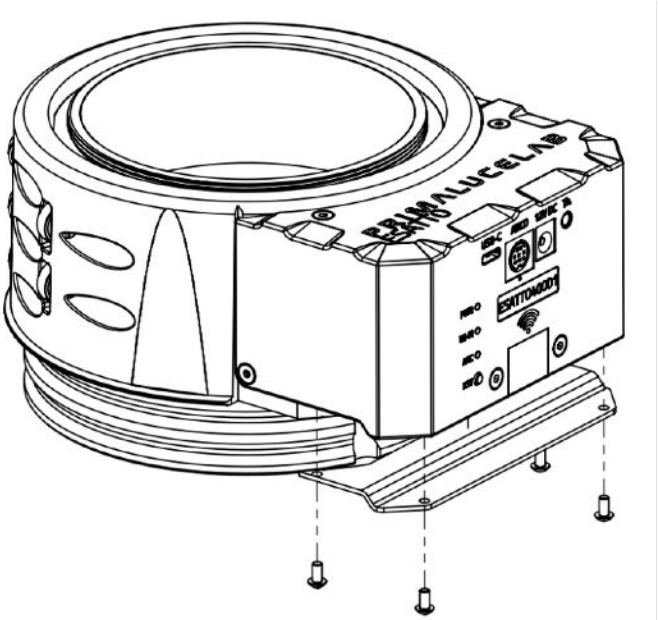

6. Reassemble the electronics cover: Carefully reattach the red cover and then the lower cover, securing all screws properly to complete the procedure.

**NOTE related to ESATTO 2” LP**: The registration procedure described in this manual applies only to standard versions of the ESATTO focuser. The ESATTO 2” LP (Low Profile) version features a different internal focusing design and does not allow user adjustment. This model is factory-set with a fixed registration optimized for its mechanical configuration. Any service or calibration of the ESATTO 2” LP should only be carried out by PrimaLuceLab authorized technicians.

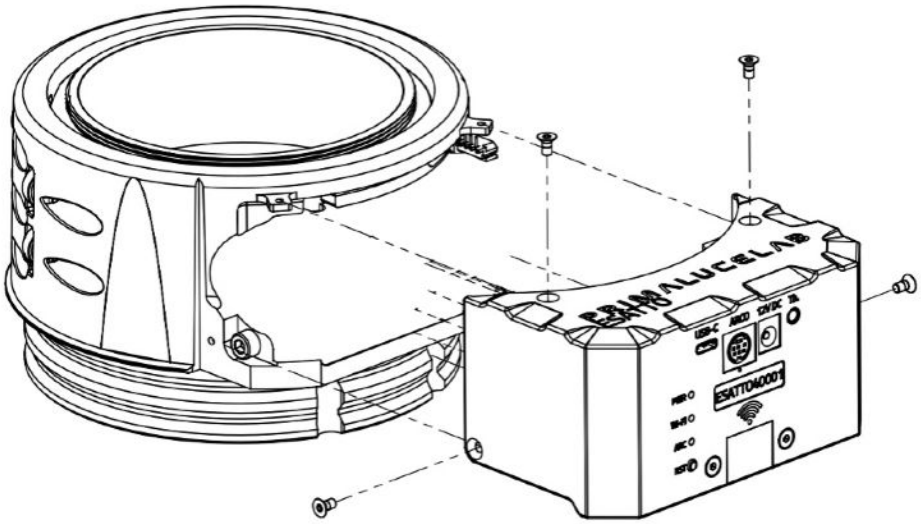
# ESATTO 3” and 4” registration procedure

To ensure optimal performance and precision, the ESATTO focuser allows users to fine-tune the pressure applied by the motorized shaft onto the draw tube. This operation, known as registration, may become necessary over time, for example due to mechanical wear or specific load requirements introduced by heavy imaging equipment. While the ESATTO is factory-set for ideal operation, customers can easily perform this adjustment themselves following the procedure described in this manual. However, it is important not to overtighten the adjustment screws, as excessive pressure may impair smooth movement or cause mechanical strain.

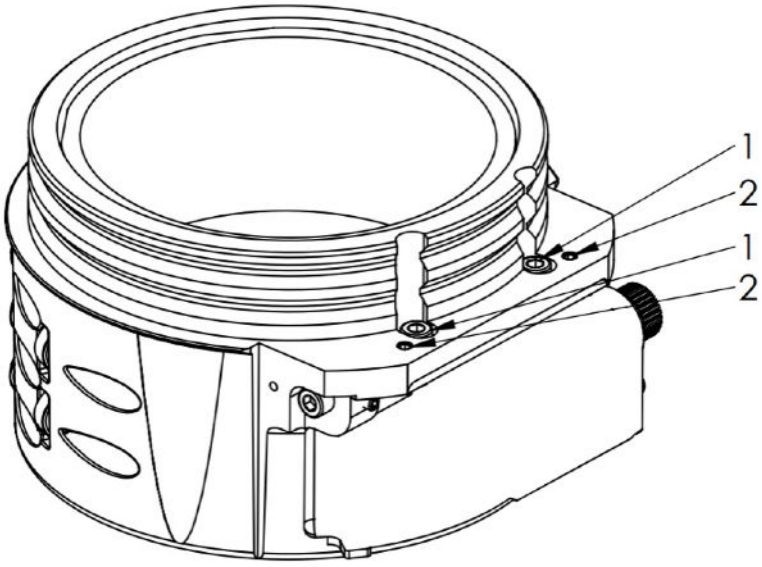
1. Remove the rear black cover: Start by removing the black rear cover of the focuser to gain access to the internal chassis.



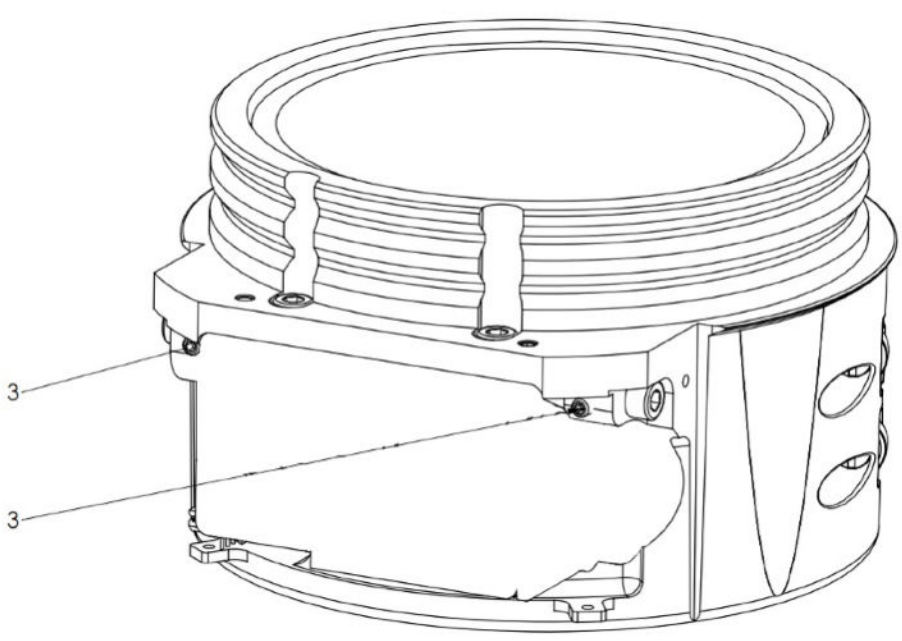
2. Remove the red cover: Unscrew the four screws holding the red bottom chassis in place and remove it carefully.



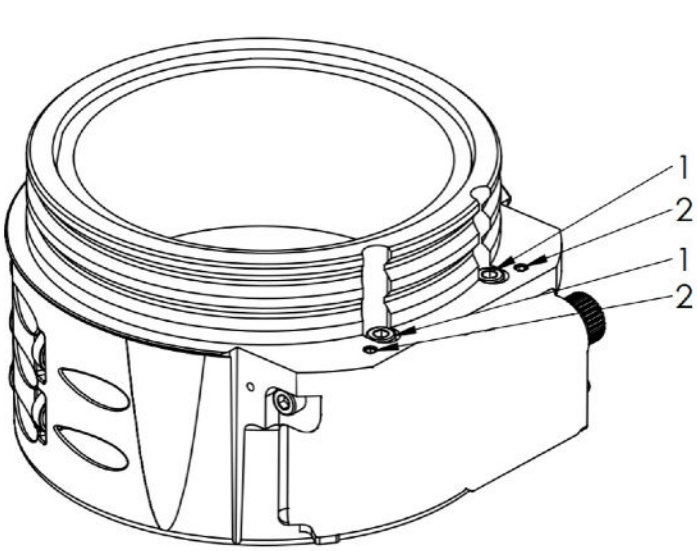
3. Slightly loosen screws 1 and 2: Locate screws 1 and 2 and loosen them slightly. These screws hold the pressure adjustment assembly and must be loosened to allow for proper calibration.



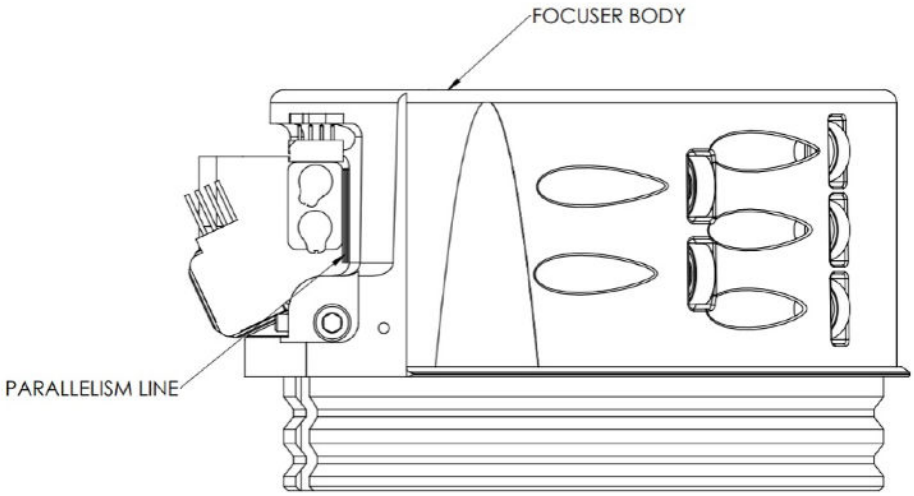

4. Adjust the Pressure via Screws 3: Identify the two screws marked as 3. These are the pressure adjustment screws responsible for regulating how firmly the shaft presses on the draw tube. Tighten them gradually to increase pressure. Avoid overtightening, as this may hinder smooth focusing movement or cause wear over time.



5. Secure screws 1 and 2 again: After achieving the desired pressure, firmly re-tighten screws 1 and 2 to secure the adjustment in place.




6. Check the parallelism: Ensure that the mechanical lines of parallelism (i.e., alignment between the draw tube and the focuser body) are still correct. Misalignment can lead to performance issues.




7. Reassemble the electronics cover: Finally, reinstall the red bottom chassis and the black rear cover, securing all screws to complete the procedure.

**NOTE related to ESATTO 3.5" LP**: The registration procedure described in this manual applies only to standard versions of the ESATTO focuser. The ESATTO 3.5" LP (Low Profile) version features a different internal focusing design and does not allow user adjustment. This model is factory-set with a fixed registration optimized for its mechanical configuration. Any service or calibration of the ESATTO 3.5" LP should only be carried out by Prima-LuceLab authorized technicians.

# INFORMATION TO USERS



According to art. 26 of Decreto Legislativo 14 marzo 2014, n. 49 "Attuazione della Direttiva 2012/19/UE sui rifiuti di apparecchiature elettriche ed elettroniche", the symbol of the barrel placed on the equipment or its packaging indicates that the product at the end of its useful life must be collected separately from other waste.

The user will therefore have to give the end-of-life equipment to the appropriate separate collection centers for electronic and electrotechnical waste or to return it to the reseller upon the purchase of a new type of equivalent equipment, one by one.

Properly differentiated collection for the subsequent start of dismantled equipment for recycling, treatment and environmentally compatible disposal helps to avoid possible adverse effects on the environment and health and favors the reuse and / or recycling of the materials contained in the equipment.

The abusive disposal of the product by the user implies the application of the administrative sanctions as per D.Lgs. 152/2006.

*Compliance with the RAEE legislation (D.Lgs. 49/2014)*
*PrimaLuceLab is registered to AEE Register with number IT17030000009790*
*PrimaLuceLab adheres to Sistema Collettivo ERP Italia for the compliance to RAEE legislation.*

European Recycling Platform

# FCC COMPLIANCE STATEMENT

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
• Reorient or relocate the receiving antenna.
• Increase the separation between the equipment and the receiver.
• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
• Consult the dealer or an experienced radio/TV technician for help.

FCC RF Exposure Statement
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm (8 inches) between the radiator and your body.

Wireless Module Compliance
This device contains an ESP32 Wi-Fi module, which has been certified by the manufacturer to comply with FCC regulations. Any modifications or changes to this device not expressly approved by PrimaLuceLab could void the user’s authority to operate the equipment.

# WARRANTY

1) The PrimaLuceLab product warranty is effective from the date of purchase and is valid only if it is with the invoice (or receipt) of purchase.

2) The warranty covers the product against defects in workmanship and includes the cost of the replaced material and labor.

3) The warranty does not cover any damage caused to the product or defects or failures that occur due to improper installation , improper use and/or deterioration due to normal wear.

4) THE GUARANTEE DOES NOT APPLY IN THE FOLLOWING CASES:
   - Repair by anyone not authorized by PrimaLuceLab .
   - Invasive interventions or tampering with internal and/or external parts.
   - Missing of the invoice (or receipt) of purchase.

TERMS OF SERVICE
Technical assistance is performed exclusively by PrimaLuceLab or its authorised resellers. All returns must be received with our permission (to be asked writing an email to **support@primalucelab.com**). YOU HAVE TO add to the shipping the invoice (or receipt) of purchase and the detailed description of the defect. For products without the invoice (or receipt) of purchase, repair and shipping costs are always paid by the customer.