SESTO SENSO 3 robotic focusing motor for external focusers

USER MANUAL

VERSION 1.1

Update 24-08-2026



SESTO SENSO 3 is made 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, SESTO SENSO 3 may damage. So please follow the instructions below:

- Do not disassemble
- Do not open, damage or subject to electric shock or excessive impact any part of SESTO SENSO 3. Do not drop.
- Do not short the electronic elements
- Do not expose at 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 SESTO SENSO 3

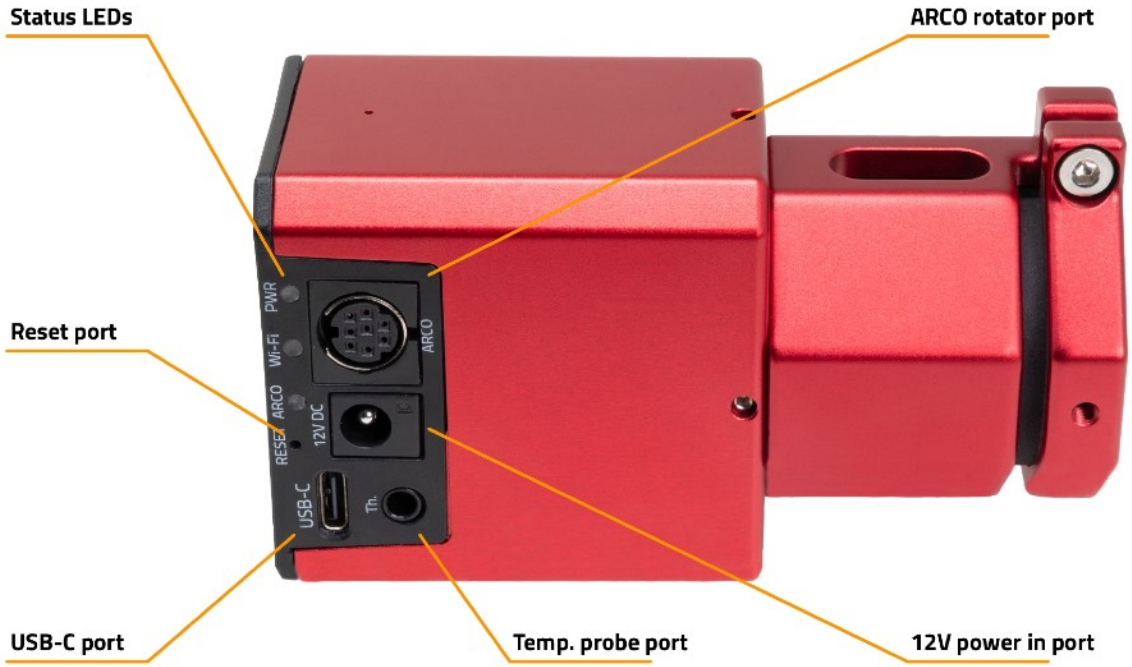
QUALITY CONTROL

Each SESTO SENSO 3 unit, after created in our laboratories, it's tested by PrimaLuceLab technical experts to check all components. We verify mechanics and electronics. In case you check any malfunction, please contact us immediately (+ 39-0434-1696106 or support@primalucelab.com). Do not try to disassemble, repair or modify yourself SESTO SENSO 3, without our written approval, in order not to loose the Producer Warrantee.

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Components Identification



Packing list

- SESTO SENSO 3
- 25mm, 26mm, 33mm shaft adapters (it connects to 37mm shaft without adapters)
- 6 color-keyed bushings for different focuser types
- USB-C to standard USB-A cable
- 12v DC cigarette-style plug power cable
- Hex keys for assembly
- Quick installation guide



CAUTION

In order to correctly use SESTO SENSO 3, you have to connect it to your telescope's focuser. The installation procedure changes based on the telescope's focuser so please refer to the next paragraphs. But if you want, you can proceed with the SESTO SENSO 3 first use also without having the focuser not installed on the telescope's focuser.

Technical specifications

Power	12V - 5.5/2.5 connector - positive tip polarity
Power consumption @ 12V	800mA max
Working temperature	-20°C / +60°C
Control with:	USB WiFi
Resolution	0,7 microns per step
Temperature probe	Internal to read motor temperature (in the package) External for focus temperature compensation (optional)
Provided software	Driver for Windows 64 bit (compatible with Windows 10/11 operative system) PLAY for control with Windows 10/11 operative system ASCOM driver for control from external software (tested with ASCOM platform 7) Virtual HandPad for wireless control without PC
Weight	370 gr. (0.8 lbs)

NOTE

In order to proceed with installation you have to download the SESTO SENSO 3 software package from the

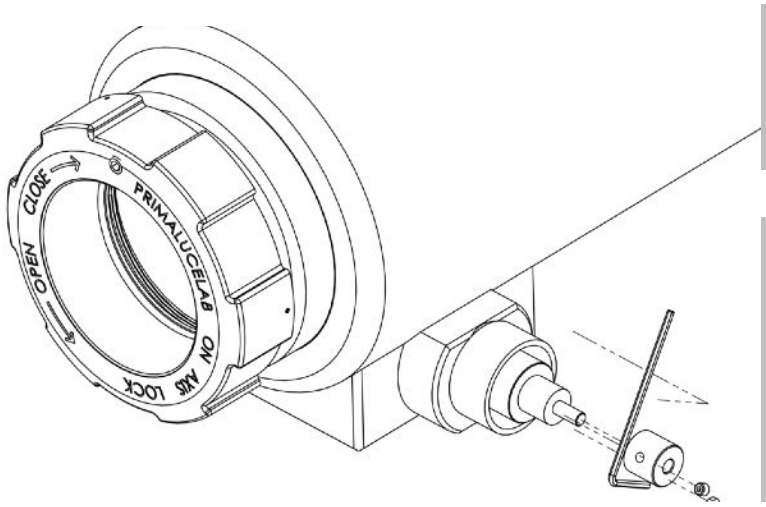
DOWNLOAD

section of our www.primalucelab.com website.

Save the package (it's in zip format) onto the EAGLE computer or standard Windows PC you want to use to control the SESTO SENSO 3 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).

Install SESTO SENSO 3 on the telescope's focuser

To install SESTO SENSO 3, start by removing the manual focusing knobs from your telescope's focuser. First, remove the micrometric knob by loosening the small screw usually located on the side of the knob. Once that is done, remove the coarse knob by loosening the Allen screw that secures it. On some focusers, especially those with plastic coverings, you may need to remove the plastic housing to access the screws. Connect one of the bushings you find in the SESTO SENSO 3 box (based on the diameter that fits your focuser) to the small focuser shaft of your focuser.



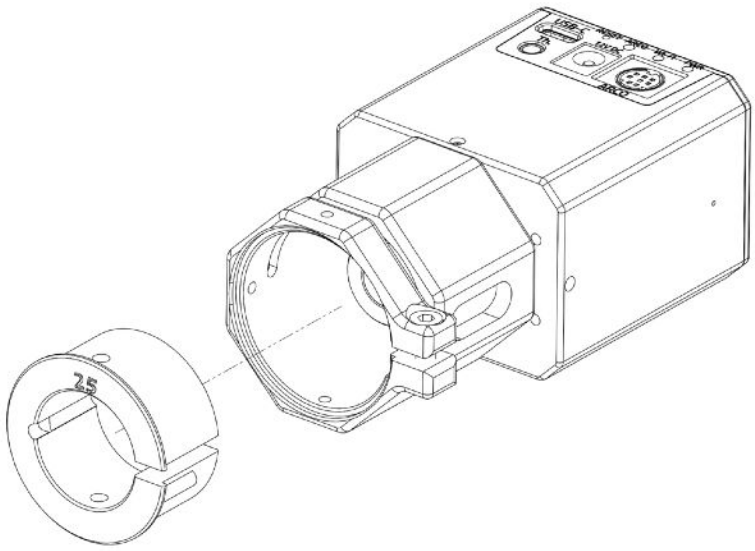
NOTE

in order to work, SESTO SENSO 3 requires your focuser to have the micro metric knob.

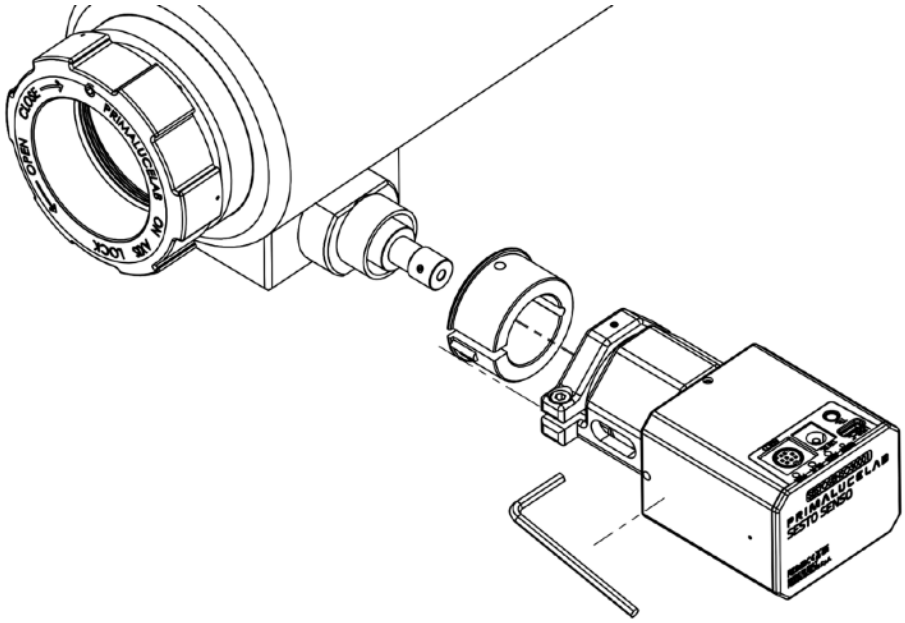
NOTE

SESTO SENSO 3 comes with the new Self Centering Clamp 2 (SCC2) that allows direct connection to focusers with 25mm, 26mm, 33mm or 37mm shafts, without the need for additional adapters.

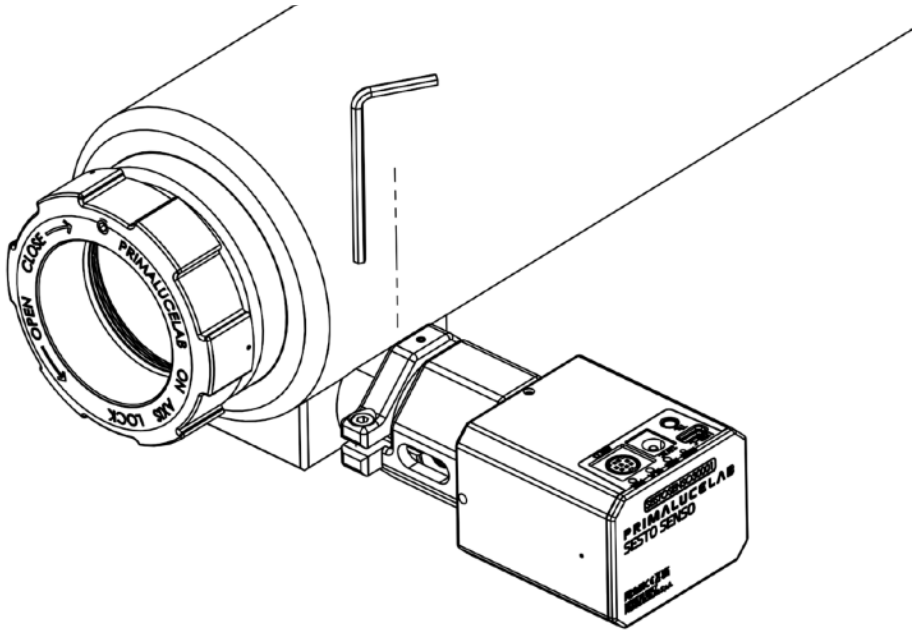
Next, select the adapter included in the SESTO SENSO 3 box that matches your focuser's shaft diameter. If your focuser has a 37mm shaft, you won't need any adapter — SESTO SENSO 3 will connect directly. If your focuser has a 25mm, 26mm, or 33mm shaft, insert the correct adapter onto the shaft. Focusers with different diameter shaft are not supported.



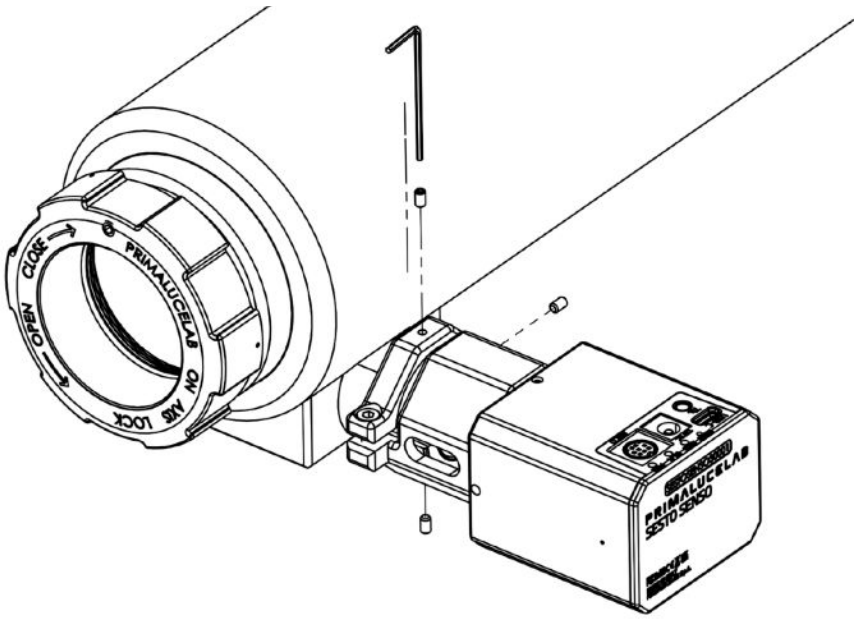
You can now connect SESTO SENSO 3 to your focuser by aligning the motor shaft with the shaft of your focuser or the installed adapter. Push SESTO SENSO 3 into position until it stops. Then, using the included Allen key, tighten the two grub screws on the front of SESTO SENSO 3 to lock its internal motor shaft to the focuser shaft.



Once the motor shaft is fixed in place, secure SESTO SENSO 3 to the focuser using the main screw on the side of the Self Centering Clamp 2.



Then, tighten the three smaller set screws around the clamp to ensure everything is firmly locked in place. Before powering SESTO SENSO 3 on, we recommend manually turning the focuser knob to check that the movement is uniform. It is normal for the rotation to feel stiffer than before, since the motor is now engaged, but the motion should still remain consistent. If you notice irregular movements, please repeat the installation procedure and/or check the mechanical condition of your focuser. Your SESTO SENSO 3 installation is now complete and ready for operation.



Please keep in mind that SESTO SENSO 3, like any focusing motor, works in conjunction with the mechanical characteristics of your focuser. Accuracy and repeatability, especially when using automatic focusing, also depend on the build quality and backlash of your focuser.

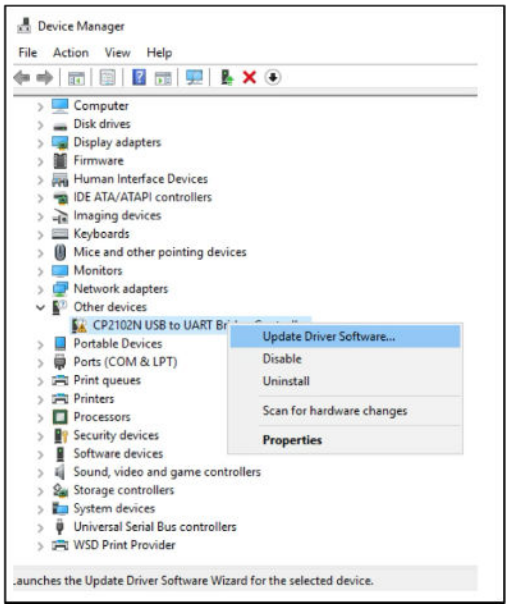
NOTE: SESTO SENSO 3 is compatible with many focusers, which may differ in machining quality and manufacturing tolerances. Focusing accuracy—particularly when using automatic focusing routines—depends largely on the focuser's mechanics, not solely on SESTO SENSO 3. If your focuser exhibits significant backlash, you can compensate for it by adjusting the backlash parameter in the software.

Install SESTO SENSO 3 in EAGLE computer or Windows 10/11 PC

SESTO SENSO 3 can be controlled either with the EAGLE computer or with any standard Windows 10 or 11 PC. The package includes a 12V power cable with a cigarette lighter plug and a USB connection cable. To set it up, connect the SESTO SENSO 3 power cable to a suitable power source (the power port is Ø5.5/Ø2.5mm, center positive), then connect the USB-C cable to a USB port on your EAGLE computer or Windows PC. The PWR LED will turn on, confirming that SESTO SENSO 3 is powered. After a few seconds, the Wi-Fi LED will also light up, indicating that SESTO SENSO 3 is online and ready for Wi-Fi connection.

In most cases, SESTO SENSO 3 will be automatically detected, and Windows will install the appropriate system driver. To verify this, open the Control Panel, go to Device Manager, and check under Ports (COM & LPT). You should see your device listed as “Silicon Labs CP210x USB to UART Bridge”. To confirm, you can unplug and reconnect the USB cable and observe how Windows lists the device.

If the device does not appear or it shows a yellow exclamation mark, it means Windows was unable to install the driver automatically. In that case, you can manually install it by following these steps:



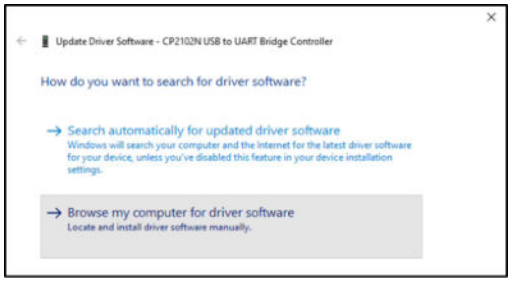
1) Download the appropriate software package from the DOWNLOAD section of our website: www.primalucelab.com

2) Unzip the downloaded file on the same EAGLE or Windows computer where you’re installing your PrimaLuceLab device.

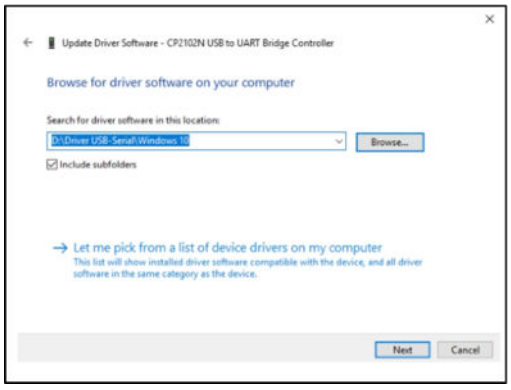
3) Open “Device Manager”.

4) Locate “CP2102N USB to UART Bridge Controller” under “Other devices”

5) Right-click on it and select “Update driver”.

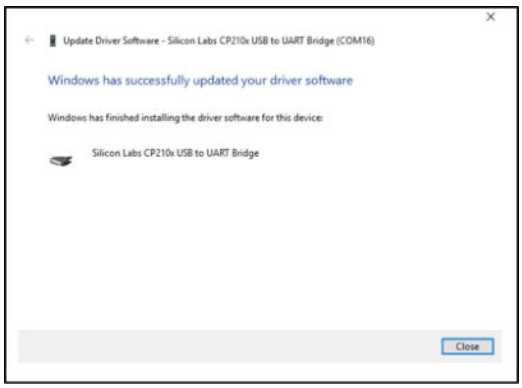


6) Choose the option “Browse my computer for driver software”.



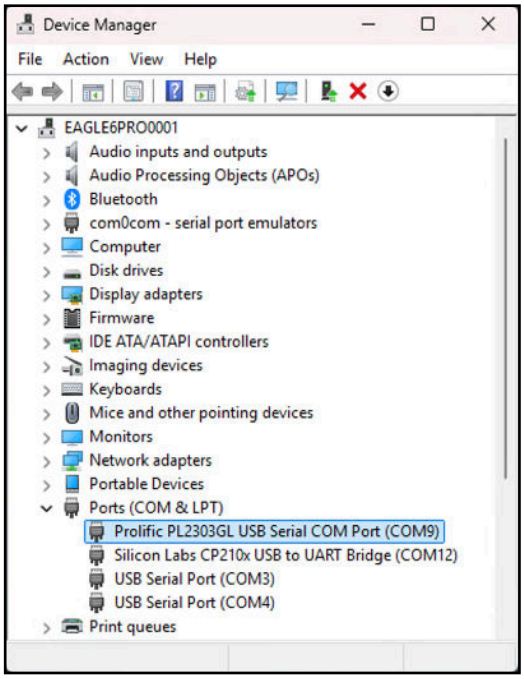
7) Navigate to the folder where you extracted the software package.

8) Click “Next” and follow the prompts to complete the installation.



Once the installation is complete, Windows will display a confirmation message. The device will now appear under Ports (COM & LPT) with a COM port number—this is the port your computer will use to communicate with your PrimaLuceLab device. From now on, you won’t need to repeat this process. Windows will remember your driver selection and automatically load it every time you boot your EAGLE or Windows computer and connect your device via USB.

NOTE: If the driver is not correctly installed on your Windows operating system, SESTO SENSO 3 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.



NOTE

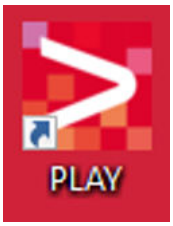
For proper operation, SESTO SENSO 3 requires an external 12V power supply—USB connection alone is not sufficient. Always connect a 12V power source (12V AC power adapter or 12V battery) to the SESTO SENSO 3 power port before connecting the USB cable to your computer.

Control SESTO SENSO 3 with PLAY software

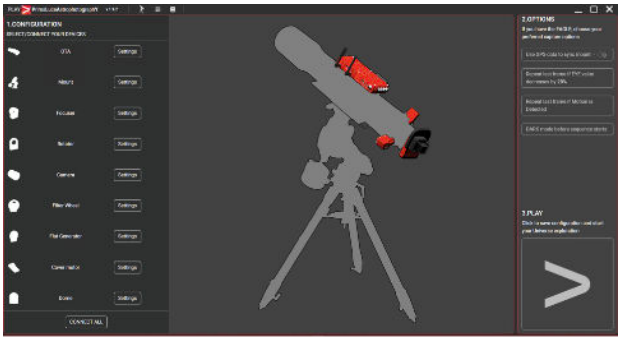
If you want to control SESTO SENSO 3 with the EAGLE computer or a standard Windows 10/11 PC, you can use our PLAY software you can download from the DOWNLOAD section of our website.



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.



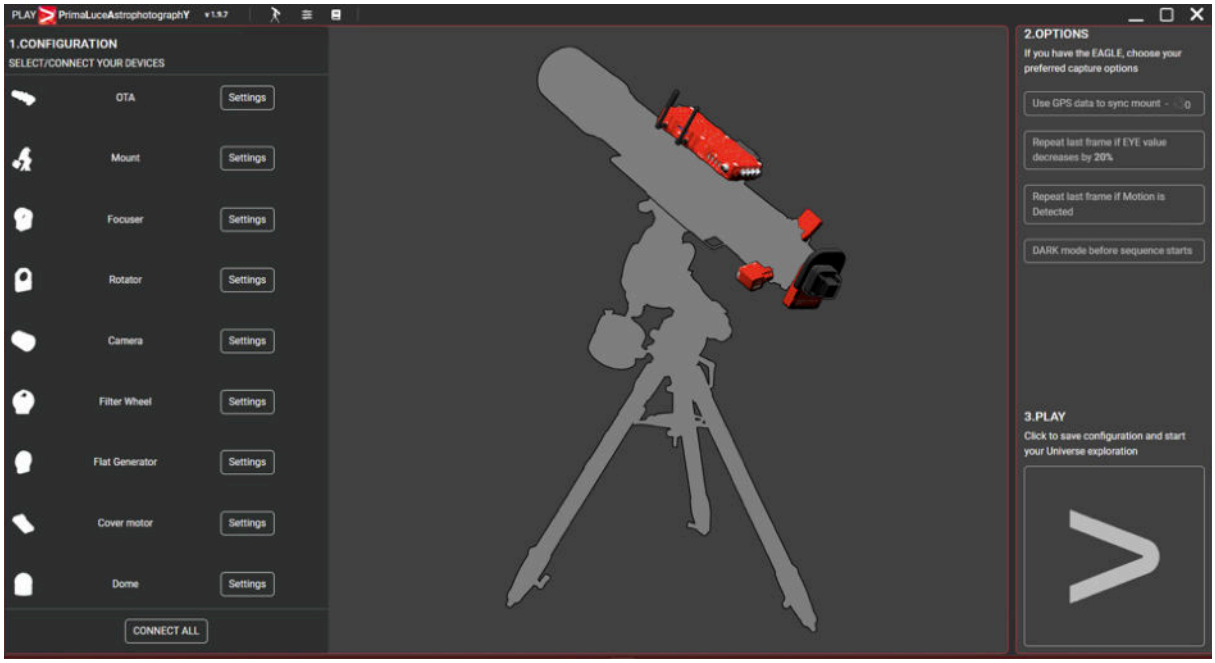
At the end of the installation process, PLAY is automatically launched.

PLAY software allows you to control not only SESTO SENSO 3 focusing motors 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.

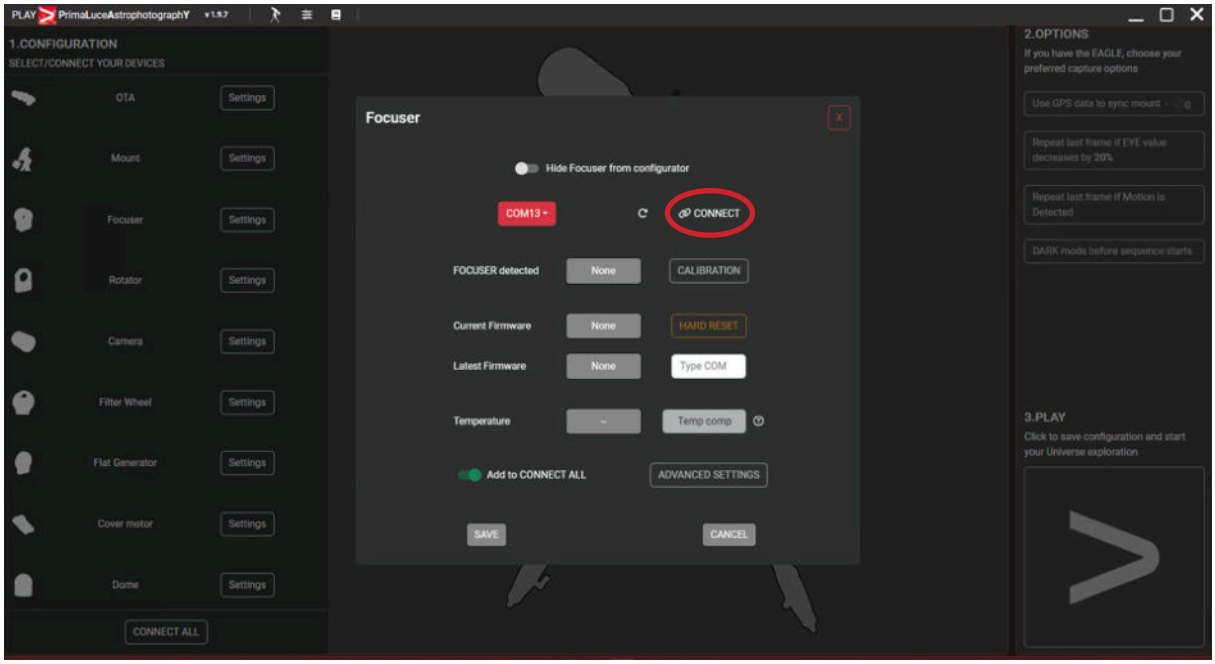
ATTENTION

In the event you need to manually reset SESTO SENSO 3 please proceed this way: with the SESTO SENSO 3 not connected to USB port and without power, press the “RST” reset button (keep it pressed for 10 seconds, until PW LED start blinking) and, at the same time, connect to 12V power. The SESTO SENSO 3 will reboot and it will be reset to factory settings.

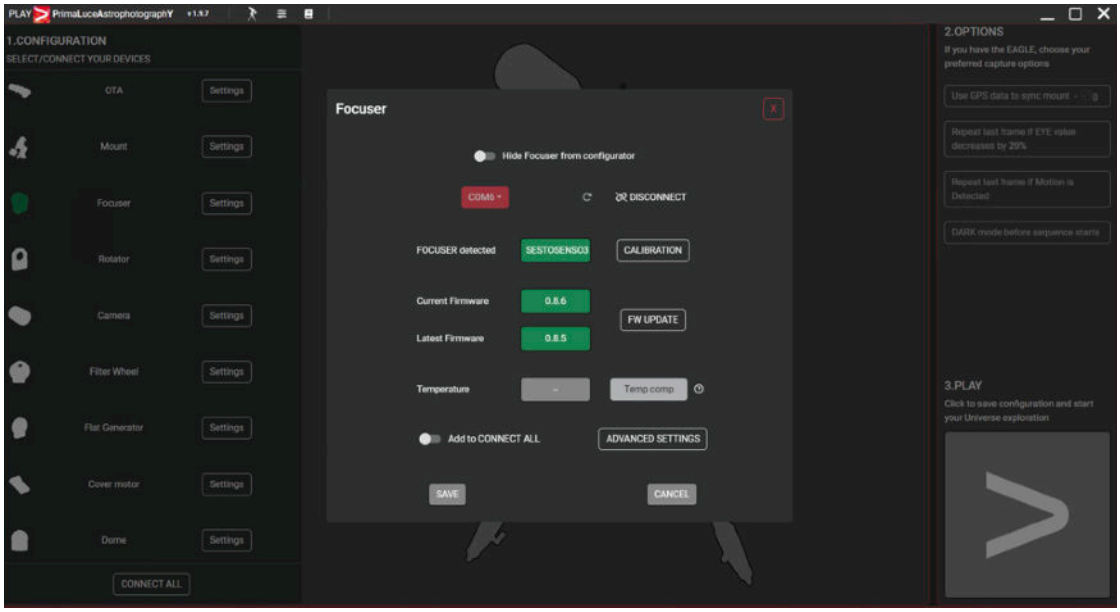
1) Launch the PLAY software, and open the **CONFIGURATOR** section where all devices are managed.



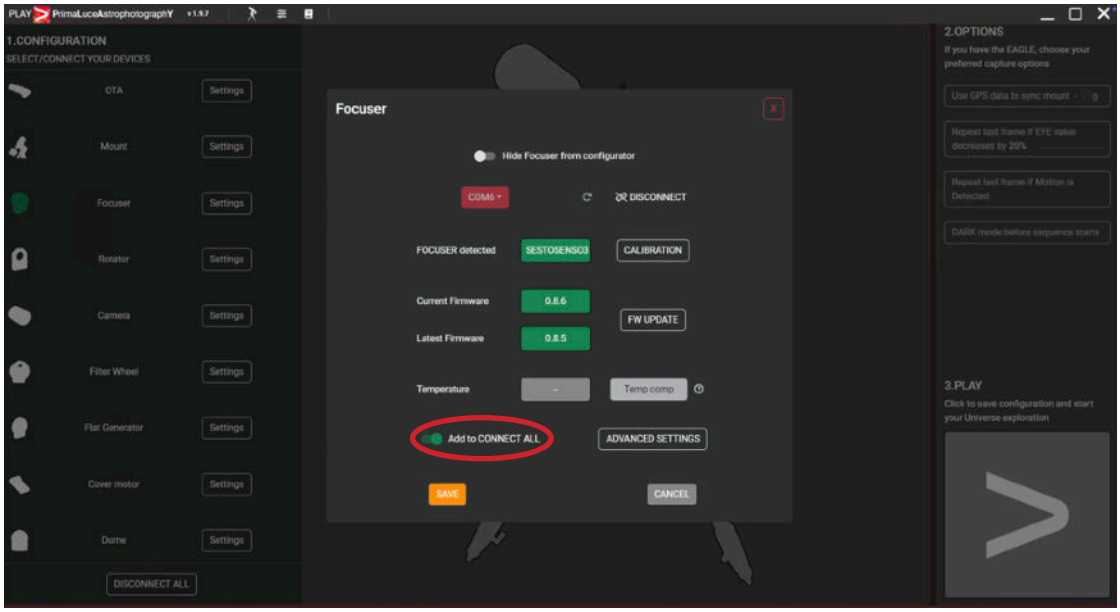
2) Click on the **Focuser** section (either by selecting the focuser icon in the central image or the “Focuser” label in the left column). This will open a popup window where you can set the COM port number assigned to your SESTO SENSO 3 focusing motor. If you are unsure which COM port is associated with SESTO SENSO 3, open the Windows Device Manager and check the COM port created when the USB cable is connected. To make identification easier, you can disconnect and reconnect the USB cable—Device Manager will update the list accordingly. Once you have selected the correct COM port, click the **Connect** icon to establish the connection to your focusing motor.



3) If the connection is successful, the button to the right of “FOCUSER detected” will turn green. You can then press the **SAVE** button to confirm and exit. The Current Firmware field shows the firmware version currently installed on your SESTO SENSO 3, while the Latest Firmware field displays the most recent version available. If a newer firmware version is available, click the FW UPDATE button to start the update procedure. Please refer to the section “Update SESTO SENSO 3 firmware with PLAY software” for detailed instructions. If you want PLAY to automatically connect to SESTO SENSO 3 the next time you start the software, enable the “Add to CONNECT ALL” option.

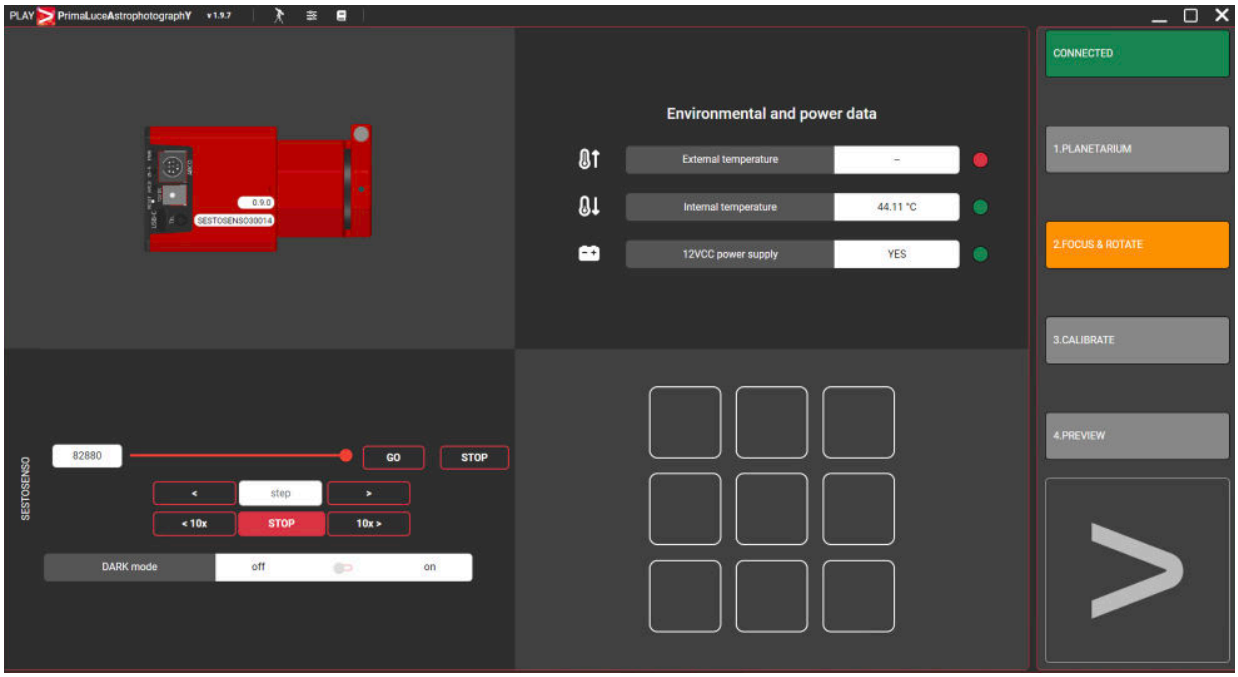


4) Before using SESTO SENSO 3, you must perform a calibration. Please refer to the next section “Calibrate SESTO SENSO 3 with PLAY software” and follow the instructions to calibrate the focusing motor. Once calibration is complete, press the SAVE button to store your focuser configuration.



5) After confirming the connection to your devices, click the large **PLAY** button (bottom-right) to enter the **CAPTURE** section of the PLAY software, where you can control your devices and begin astrophotography.

6) At the top-right of the screen, you will see the green CONNECTED notification, confirming that the devices you configured in the previous steps are now connected. The **FOCUS & ROTATE** tab will be selected, showing the active connection to your SESTO SENSO 3 focusing motor.



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

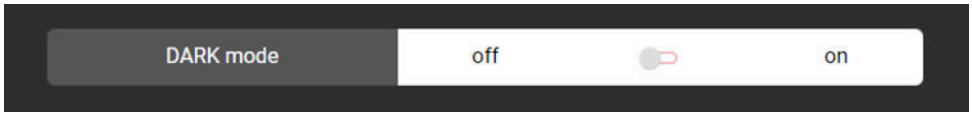
I. if you connect SESTO SENSO 3 to your computer only with the USB cable, you will see a green light illuminated in the right of the "Internal temperature" row
II. If you have connected an optional temperature sensor, you will also get the green light in to the right of "External temperature" row
III. Since SESTO SENSO 3 requires also 12V power (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 "12VCC power supply" row.

Moving the SESTO SENSO 3 focusing motor is very easy. You can do this in different ways:

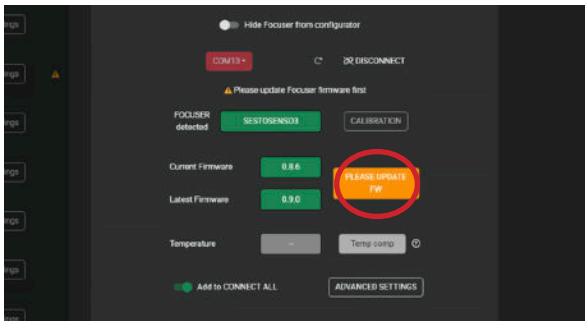
I. Move the slider until you reach the desired position and press the **GO** button
II. Click on the area to the left of the slider, enter the number you prefer and then press the **GO** button
III. Click on the area with "step" label, insert the number you wish and press the **<** or **>** buttons to 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.

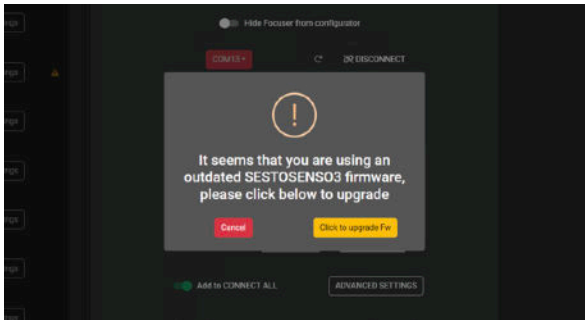
7) In the bottom-left area of PLAY window, you can find the settings of the focuser. Here you can set:
- *DARK mode*: it allows you to activate DARK mode that will turn off focusing motor's LED lights (please note that, if you turn them off, you won't be able to check the SESTO SENSO 3 status without controlling it via the provided software).



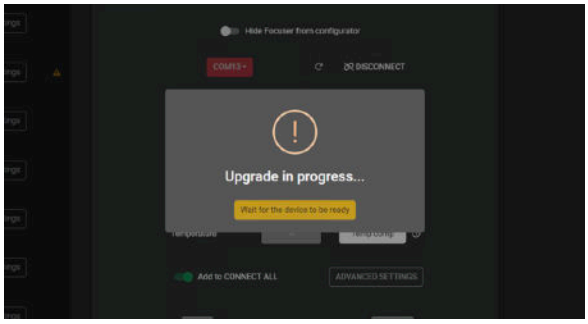
Update SESTO SENSO 3 firmware with PLAY software



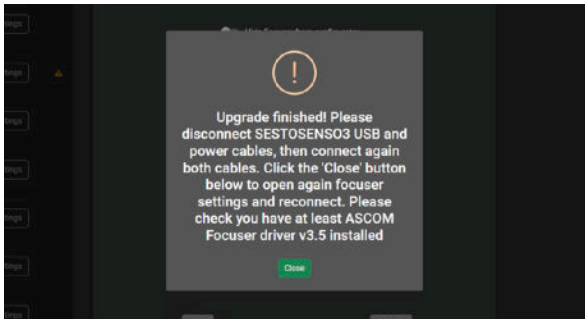
To update the SESTO SENSO 3 firmware, first make sure you are using the latest version of PLAY. If a newer version is available on our website, uninstall the older version and install the latest release. Launch PLAY and connect to the SESTO SENSO 3 focusing motor. If the Latest Firmware is newer than the Current Firmware, PLAY will notify you firmware has to be updated: please click the **FW UPDATE** button to begin the update procedure.



Please press the **Click to upgrade Fw** button to launch firmware update.



The firmware update process will now begin. Do not disconnect the USB or power cables until the procedure is complete.



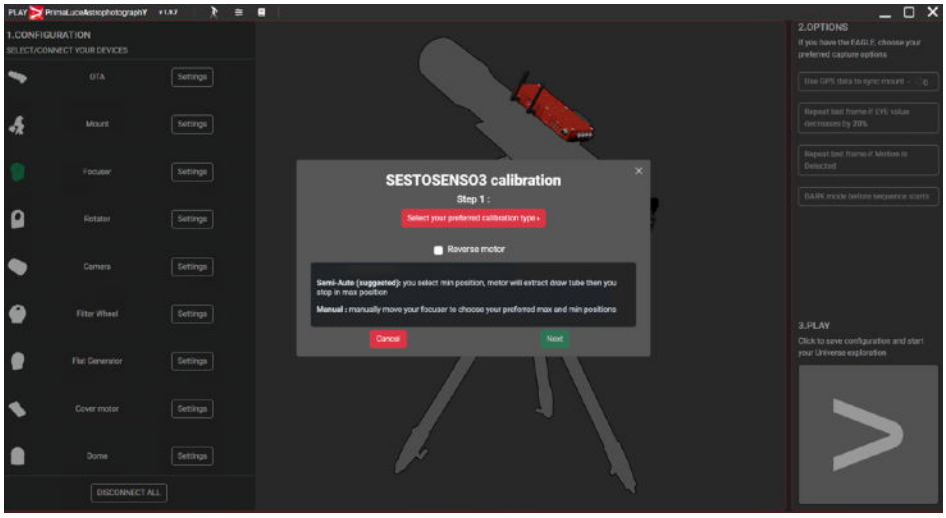
Once the update has finished, you will see the confirmation window. Here you can click the **Close** button, then disconnect both the USB and power cables from SESTO SENSO 3. Now reconnect them to your computer.
Now, in the FOCUSER settings window, select the COM port assigned to your SESTO SENSO 3 focusing motor and click the **Connect** icon to re-establish the connection.

Calibrate SESTO SENSO 3 with PLAY software

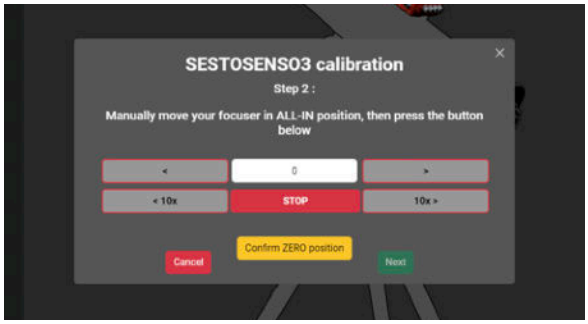
For proper operation, SESTO SENSO 3 requires calibration after installation on the focuser. To perform calibration, once you are connected to the SESTO SENSO 3 focusing motor, go to the Focuser section of the CONFIGURATOR and click the CALIBRATION button. A new window will then appear.

You can choose between two calibration methods:

- **Semi-Auto** (suggested): Set the minimum position, then the motor will extend the drawtube until you stop it at the maximum position.
- **Manual**: Manually move your focuser to define your preferred minimum and maximum positions.



Step 1: Click the **Select your preferred calibration type** button and press **Next** button.



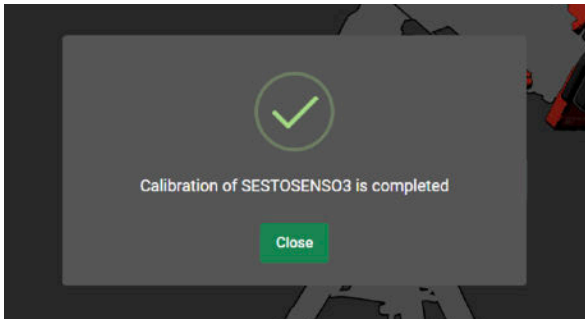
<u>If you selected the **Semi-Auto** method</u>:

- *Step 2*: Manually use your focuser's coarse knob to move the drawtube to the all-in position. (Alternatively, you can enter a number of steps in the field and use the buttons to move it remotely.) Once the drawtube is fully in, press **Confirm ZERO position**.



- *Step 3*: Press the **START** button to begin moving the focuser outward. The SESTO SENSO 3 motor will start extending the drawtube. Press **STOP** before the drawtube reaches the **all-out** position.

⚠ **NOTE: if the SESTO SENSO 3 motor starts moving but the focuser's drawtube does not, we recommend performing a Manual calibration instead of a Semi-Auto calibration.**

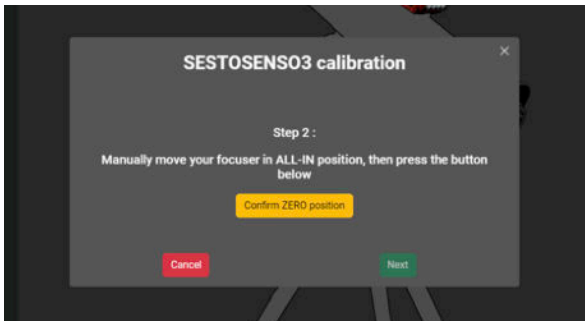


⚠ **Important:** Be sure to stop the motor before it reaches the mechanical end of travel, as this may damage the focuser or the SESTO SENSO 3 motor. Then press **NEXT** to continue.

- *Step 4*: A notification will appear confirming that calibration is complete. Press **Close** to finish the process.

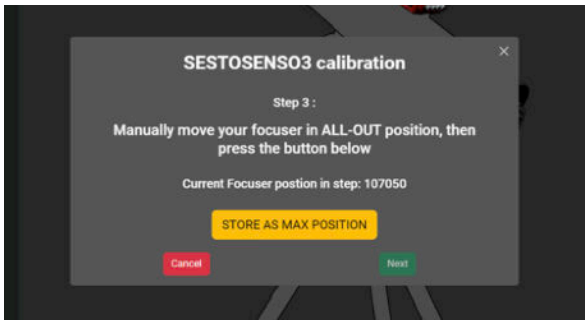
ATTENTION

Semi-Auto Calibration may not be precise in case of mechanical issues with the focuser, for example if there is slippage between the fine and coarse focusing knobs or if the draw tube travel is not smooth. In this situation, we recommend performing the Manual Calibration procedure. Carefully move the draw tube slowly to both the fully in and fully out positions, allowing the encoder to precisely detect the motor position.

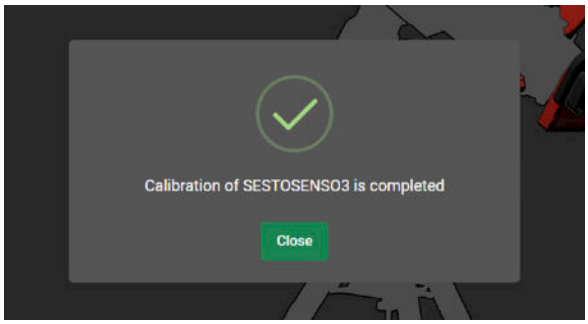


If you selected the **Manual** method:

- *Step 2*: Manually use your focuser's coarse knob to move the drawtube to the all-in position. In order to avoid slippage in focuser's mechanism, we suggest you to turn the coarse knob **slowly**. Once it is fully in, press **Confirm ZERO position**.



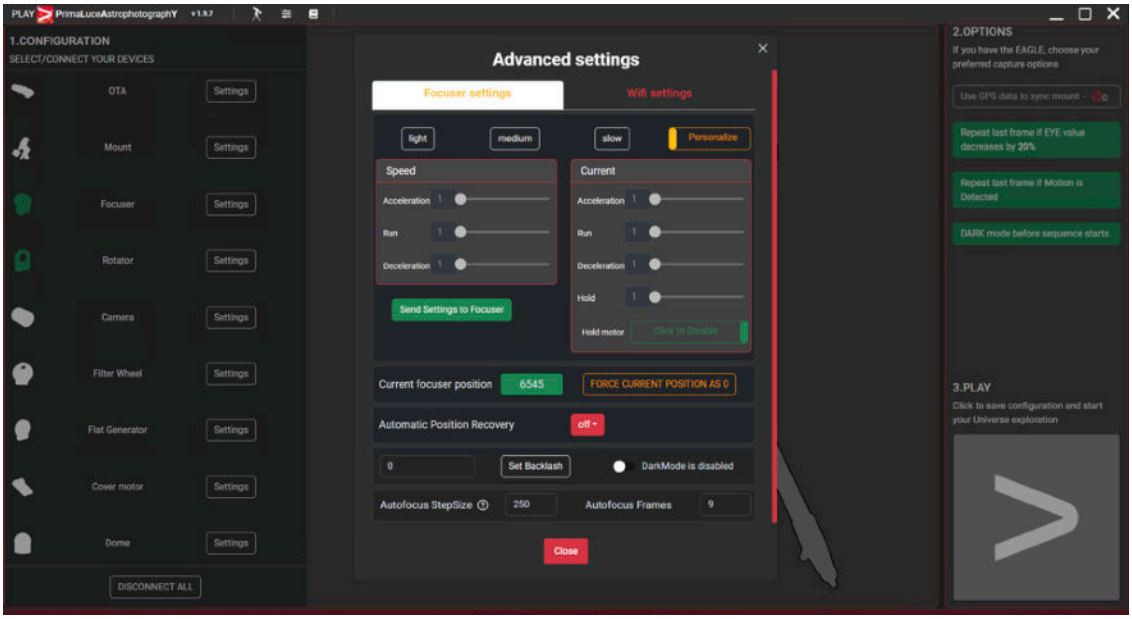
- *Step 3*: Manually use your focuser's coarse knob to move the drawtube to the all-out position. In order to avoid slippage in focuser's mechanism, we suggest you to turn the coarse knob **slowly**. Once it is fully out, press **STORE AS MAX POSITION**. Then press **NEXT** to continue.



- *Step 4*: A notification will appear confirming that calibration is complete. Press **Close** to finish the process.

SESTO SENSO 3 Advanced Settings in PLAY software

By clicking the ADVANCED SETTINGS button in the Focuser configurator, you will open the **Advanced Settings** page. Here you can adjust parameters to fine-tune the operation of SESTO SENSO 3 with your telescope's focuser—for example, to optimize performance when supporting the weight of your astrophotography accessories (camera, off-axis guider, filter wheel, etc.).



In the first tab, Focuser Settings, you will find several preset profiles designed to simplify the customization of SESTO SENSO 3 motor settings. These profiles provide a starting point for creating the ideal configuration, based on the load applied to your focuser and the movement speeds you prefer.

- **Light** button is recommended for light loads.
- **Medium** button is recommended for medium loads.
- **Slow** button is recommended for heavy loads.
- If you click on **Personalise** button you will be able to personalise the 3 presets to your preferred values. In this case, after you modify a value, you have to press the button **Send Settings to Focuser** in order to save it.

In the first set of commands ("Speed"), the operating currents of the SESTO SENSO 3 motor are reported, the values that can be set range from 0 to 10.

- **Acceleration**: set the current in acceleration ramp
- **Run**: set the current after acceleration ramp during RUN
- **Deceleration**: set the current in deceleration ramp

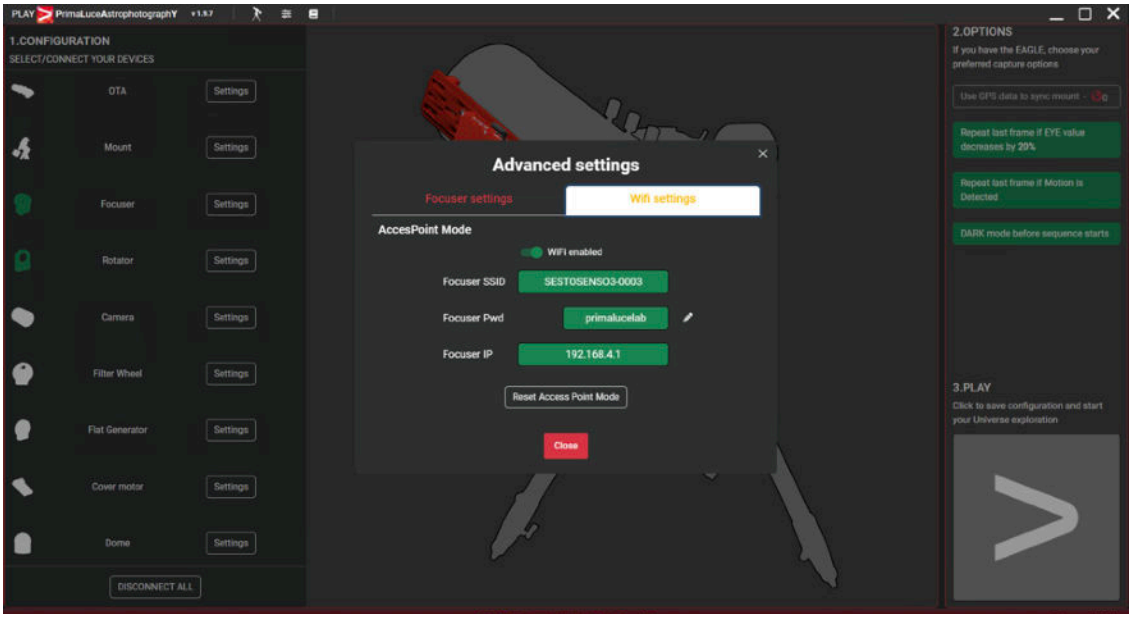
In the second set of commands ("Current"), the SESTO SENSO 3 motor movement speed parameters are set.

- **Acceleration**: set the acceleration during starting ramp (Range from 0 to 10)
- **Run**: set the speed value after acceleration ramp (Range from 0 to 10)
- **Deceleration**: set deceleration value after slowdown ramp (Range from 0 to 10)
- **Hold**: set the hold current, when the motor is stopped

NOTE: If the focuser's micrometer reduction system slips between the micrometer pin and the focuser shaft, you can minimise the effect of this issue by setting Acceleration, Run, and Deceleration (in Speed Settings) to 1.

In the lower part of the **Focuser settings** window you have different settings you can use in order to fine tune your SESTO SENSO 3 focusing motor:

- Current focuser position shows the actual position in steps. You can click on the **FORCE CURRENT POSITION AS 0** in order to reset your calibration value to minimum focuser draw tube travel position.
- **Automatic Position Recovery** button allows to automatically restore the previous focus position if focuser movement is detected. This feature is particularly useful in public or educational observatories, where visitors or users may be tempted to manually turn the focuser knob or if the focuser is accidentally moved. Another useful application is when the focuser drawtube shifts under load (please note that SESTO SENSO 3's encoder is able to detect only shaft movements, not internal focuser slips that cannot be corrected by just the focusing motor but depend on the focuser itself). If you enable this function, you can set a recovery delay (from 0 seconds for instant reaction up to 20 seconds) after which SESTO SENSO 3 automatically returns to the previous focuser position.
- **Set Backlash** allows you to specify a specific backlash value for your focuser. Type a value in steps in the area and press the Set Backlash button to save the value in SESTO SENSO 3 electronics. Please note that this value depends on your focuser and, since every focuser is different, you may have to test different values in order to find the one that better fits your focuser.
- **Autofocus StepSize** allows you to specify a different number of steps for autofocus routine in PLAY. Default value is 250 steps.
- **Autofocus Frames** allows you to specify a different number of frames for autofocus routine in PLAY. Default value is 9 frames.



In the **WiFi settings** tab, you will find all the options related to the wireless connection of the SESTO SENSO 3 focusing motor:

- **WiFi** switcher – Enables or disables wireless connectivity. When changing the WiFi status, a notification will appear: "Please wait while we reboot the Focuser to apply new settings."
- **Focuser SSID** – Displays the name of the wireless network created by SESTO SENSO 3. This value cannot be changed.
- **Focuser Pwd** – Allows you to change the default wireless password (primalucelab). When you update it, you will see the notification: "Please disconnect the Focuser, remove power, and reconnect again to apply the new password."
- **Focuser IP** – Shows the IP address of SESTO SENSO 3, which can be used to access it with the Virtual HandPad when connected via WiFi. This value cannot be changed.
- **Reset Access Point Mode** - Restores SESTO SENSO 3 WiFi mode to Access Point that is the default factory condition.

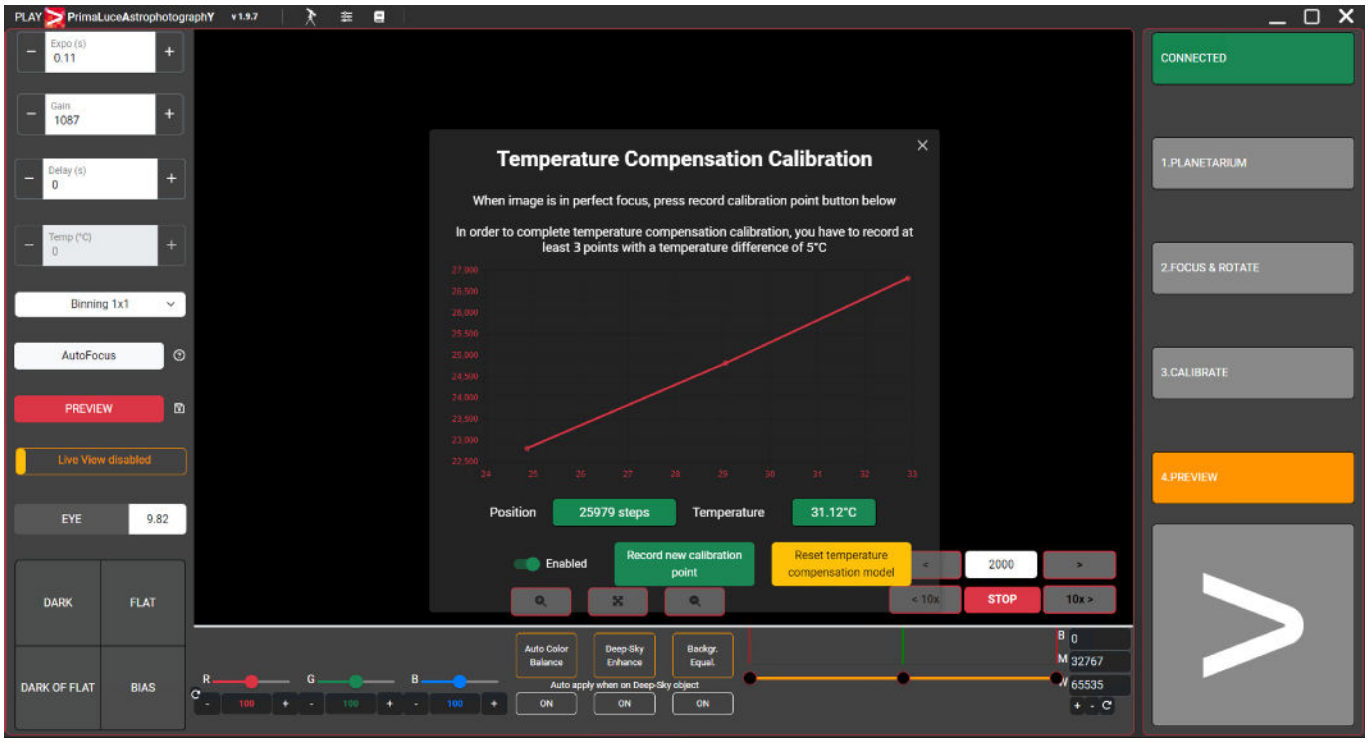
Advanced use: Focus Temperature Compensation with SESTO SENSO 3

When the outside temperature changes during an imaging session, the metal parts of a telescope slightly expand or contract. This causes the focus position to drift, meaning that a sharp image at the beginning of the night may slowly become blurred as the temperature drops. Modern astrophotography software can usually handle this effect by running an autofocus routine after a certain time or after a set number of exposures, which is a very precise method of correcting focus drift. However, when using very fast focal ratio telescopes (for example f/3 or faster), focus can drift even within the duration of a single exposure. In these cases, Focus Temperature Compensation is important: by monitoring temperature changes with a sensor and applying small, calculated focuser adjustments in real time, it maintains focus throughout the exposure. After calibration, the software determines how much the focus changes for each degree Celsius (the temperature coefficient) and applies micro-adjustments whenever the temperature changes.

Note: this feature requires the optional temperature sensor, which must be connected to the SESTO SENSO 3 port.

Before using Focus Temperature Compensation, it is necessary to calibrate your system, since the required focuser adjustments depend on how your entire optical setup responds to temperature variations. Calibration determines the temperature coefficient (steps per degree Celsius) that defines how much the focuser must move for each degree of temperature change. This calibration process can be performed with PLAY software, which guides you through the measurements needed to obtain accurate results.

After you connect SESTO SENSO 3 to PLAY, click on “**Temp comp**” button to open the Temperature Compensation Calibration window. When image is in perfect focus, press “**Record new calibration point**” button. In order to complete temperature compensation calibration, you have to record at least 3 points with a temperature difference of 5°C.
Click the ENABLE switch to activate Temperature Compensation, then click the X button in the upper-right corner of this window. The Temperature Compensation will be automatically applied to your SESTO SENSO 3, not only when you use it with PLAY but also if you control it with third-party astronomy software through the PLL ASCOM Focuser driver. Once enabled, whenever SESTO SENSO 3 detects a temperature variation, it automatically moves the focuser position in calculated steps according to the Focus Temperature Compensation calibration you previously executed, ensuring focus is maintained without user intervention.
Please note that the Temperature Compensation algorithm may not provide accurate results for temperature values that are significantly lower or higher than the temperature used during the calibration process.



Control SESTO SENSO 3 with Virtual HandPad

SESTO SENSO 3 can also be controlled without an EAGLE computer or a standard Windows 10/11 PC, by connecting from any smartphone, tablet, or even a computer via WiFi and using the built-in Virtual HandPad. The following guide shows the process on an iOS device, but the steps are similar for other devices.



1. After powering on SESTO SENSO 3, enable WiFi on your device (smartphone, tablet, or computer).

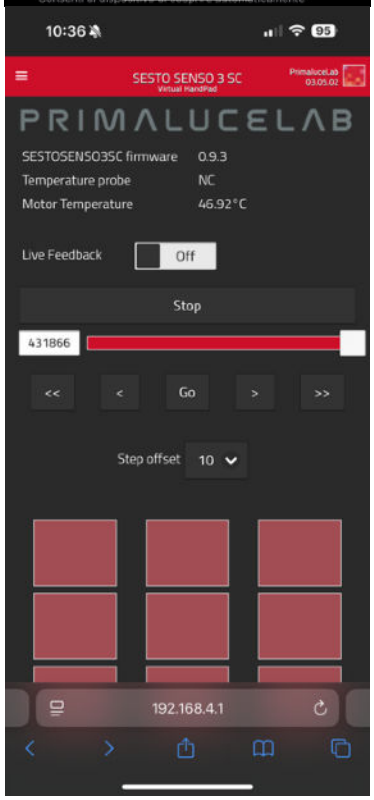
2. Look for the WiFi network named SESTOSENSO3xxxxx, where xxxxx corresponds to the serial number of your unit. Select this network.

3. When prompted, enter the default password primalucelab (or the new password if you have changed it in the PLAY software, as described in the previous section). Then press Login.

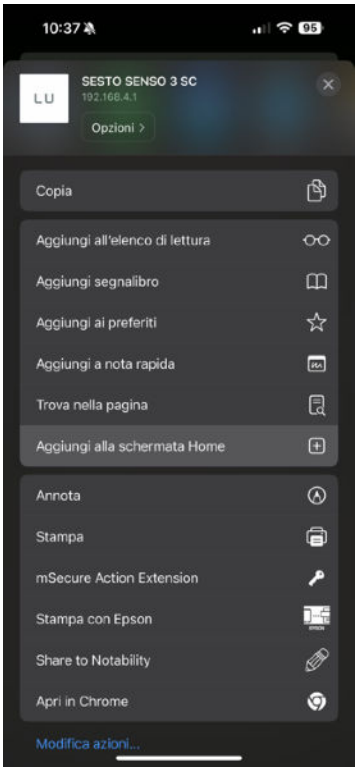
4. On future connections, you will not need to re-enter the password: your device will automatically connect to the SESTOSENSO3xxxxx network unless you change the login password.

5. Wait a few seconds until your device confirms it is connected to the SESTOSENSO3xxxxx network.

Note: If you see a “No Internet Connection” notification after connecting to the SESTO SENSO 3 WiFi network, this is normal and does not indicate a problem. The SESTO SENSO 3 is not designed to provide Internet access.



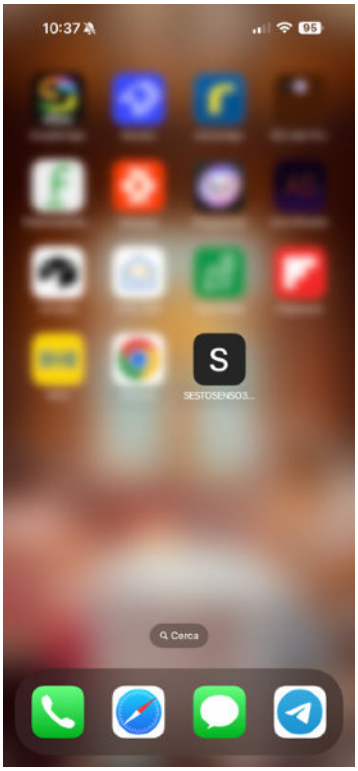
Now open the browser on your device (for example, Chrome or Safari). In the address bar (the field where you normally type a web address such as www.primalucelab.com), enter **192.168.4.1** and press **Return/Enter**. The SESTO SENSO 3 Virtual HandPad will then appear on your screen.



To create a shortcut directly on your device's home screen, tap the Share button and then select **Add to Home**.



You can customize the name or keep the default "SESTO SENSO 3". Finally, tap **Add** to confirm.



The connection to SESTO SENSO 3 will be established, giving you a direct and immediate link to the device.

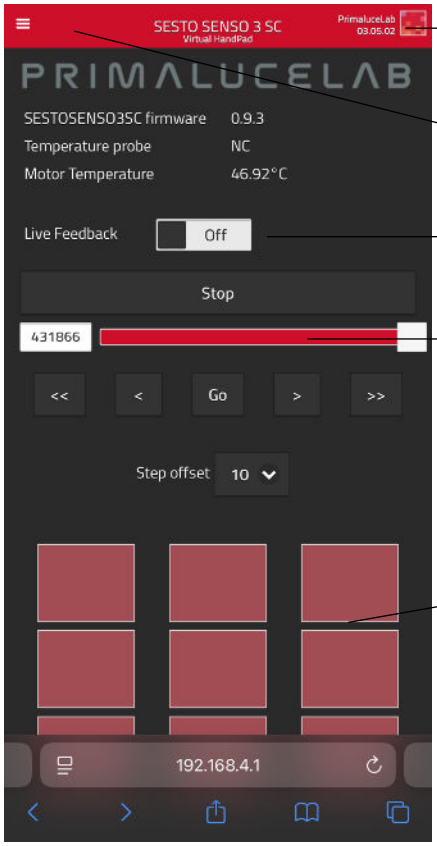
Tap the SESTO SENSO 3 button to launch the Virtual HandPad.

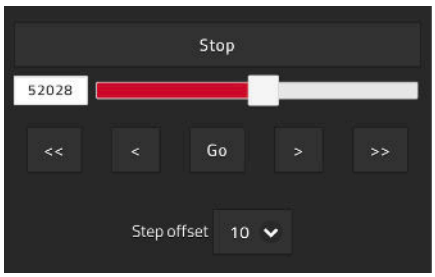
The Virtual HandPad allows you to control and operate the SESTO SENSO 3 focusing motor without the need for an EAGLE computer or a standard Windows 10/11 PC.

At the top-right of the screen, you can see the Virtual HandPad version. Just below, you will find the SESTO SENSO 3 firmware version, the external temperature (if the optional temperature sensor is connected), and the internal motor temperature.

In the central area, you can find the “Live Feedback” button that, if activated, allows the real time synchronisation of the Virtual HandPad with the motor position. Then you find a slider and control buttons to move SESTO SENSO 3, along with a step selector.

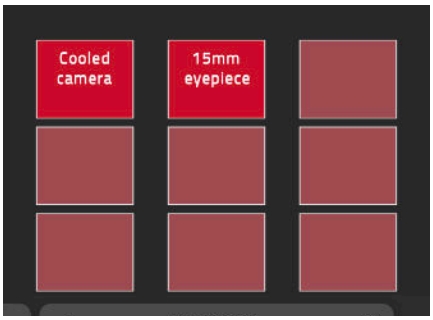
At the bottom, you will find 9 programmable buttons that allow you to save, name, and recall up to nine different focus positions with a single tap.





Moving the SESTO SENSO 3 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 keyboard 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.

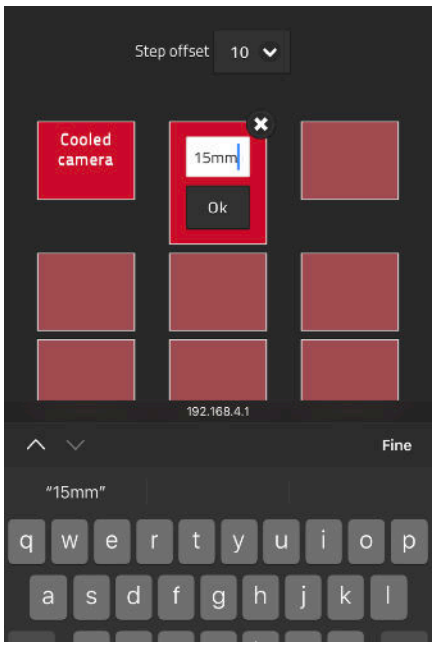


In any moment, if you need to immediately stop the movement, press the STOP button in the upper part.

In order to save a new position in the Virtual HandPad, first of all you have to move the SESTO SENSO 3 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:

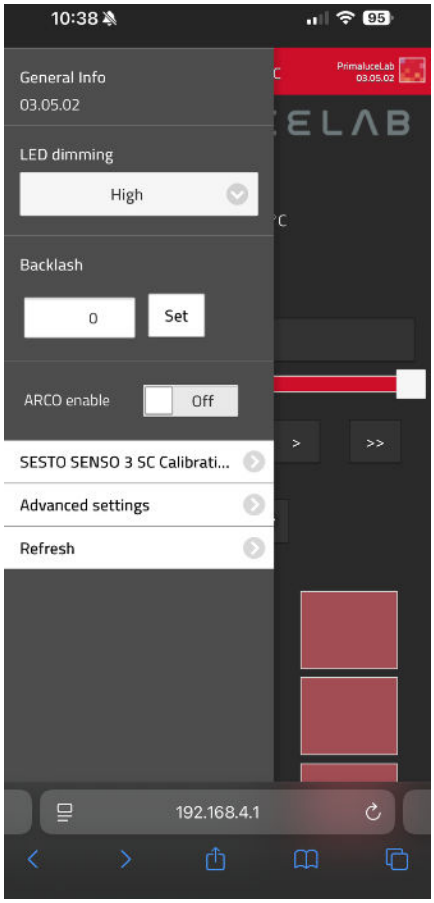
Tap and keep your finger on one of the empty buttons: the position will be automatically saved with a “Preset” name.

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 a focus position in the SESTO SENSO 3 Virtual HandPad, the same positions will also be available when you control SESTO SENSO 3 via USB from your EAGLE or an external computer.



By pressing the top-left button on the Virtual HandPad main screen, the Options menu will appear. Here you can configure the following:

1) *LED dimming*: Adjust the brightness of the SESTO SENSO 3 LEDs to your preferred level. The selected setting is automatically stored in the device.

2) *Backlash*: Enter the number of steps to be stored as the backlash value, then press **Set** to confirm.

3) *ARCO enable*: Use this switch to activate the optional ARCO rotator (requires connection to the SESTO SENSO 3 via the ARCO cable).

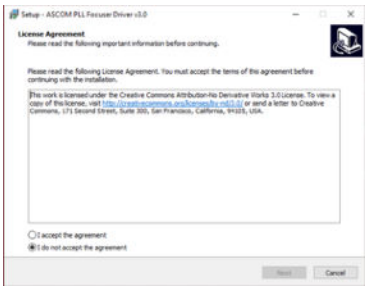
4) *SESTO SENSO 3 Calibration*: Press this button to repeat the calibration process. For details on available calibration methods, see the section “Calibrate SESTO SENSO 3 with PLAY software.”

5) *Advanced settings*: Access advanced configuration options for your SESTO SENSO 3. For guidance, refer to the section “SESTO SENSO 3 Advanced Settings in PLAY software.”

Connecting SESTO SENSO 3 to third party softwares through ASCOM drivers

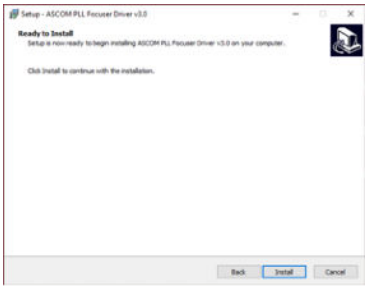
In order to control your telescope focus with SESTO SENSO 3 you can also use third party softwares instead of the PLAY described in the previous paragraphs. In order to do this, you can use SESTO SENSO 3 ASCOM drivers.

In order to install SESTO SENSO 3 ASCOM driver in the EAGLE or Windows computer you use to control SESTO SENSO 3, please follow these steps:

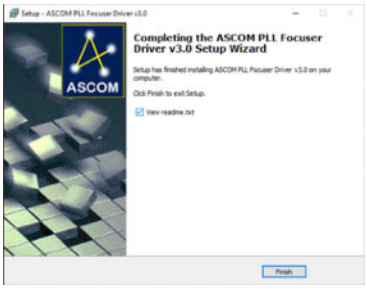


Make a double click on the **PLL ASCOM Focuser.exe** file that is part of the SESTO SENSO 3 software package you downloaded from our website.

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

Now you can control SESTO SENSO 3 focusing motor 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:

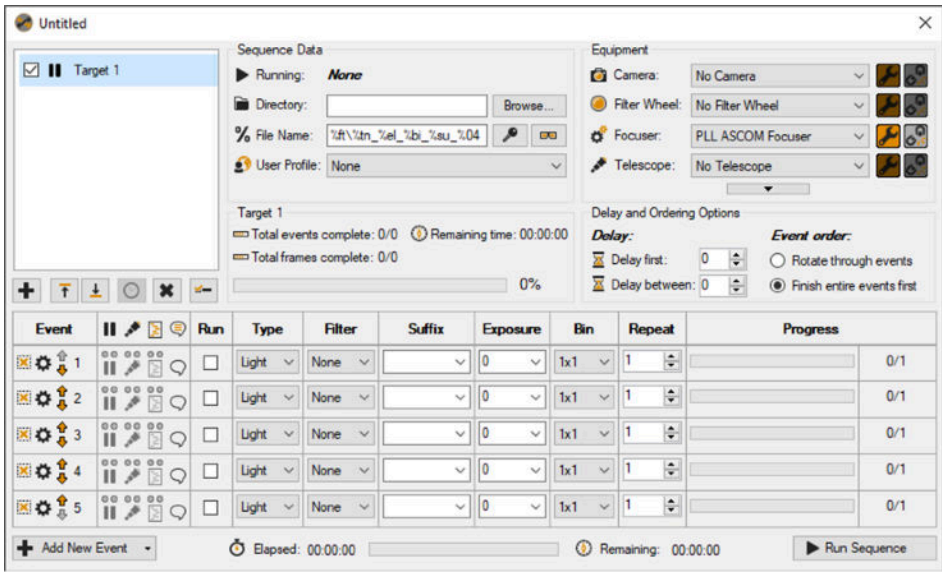
NOTE

ASCOM is an open platform that allows an integration between astronomy softwares and devices. In order to use SESTO SENSO 3 with ASCOM drivers, first all you have to download the ASCOM platform (from https://ascom-standards.org website, SESTO SENSO 3 has been tested with ASCOM platform 7) and install it in the Windows computer you use to control SESTO SENSO 3.

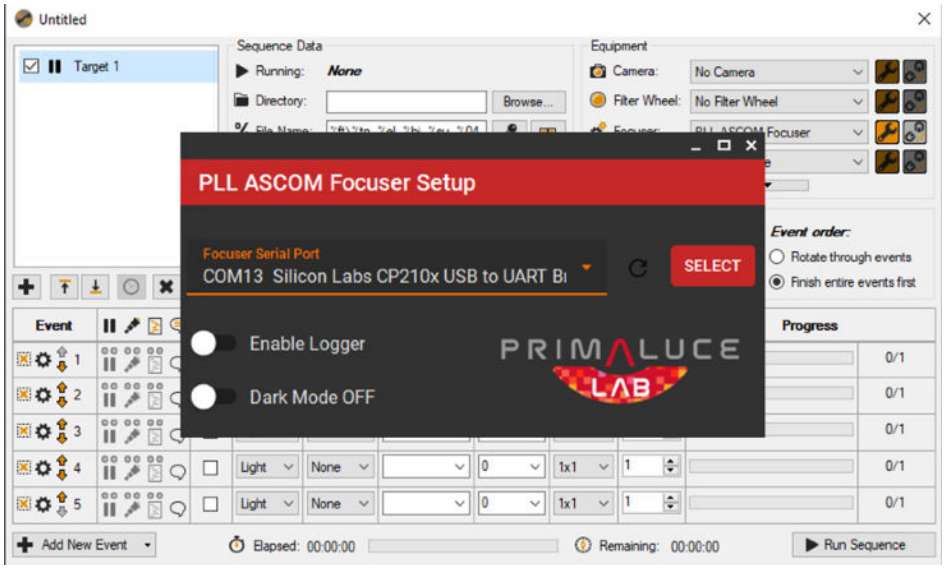
NOTE

The SESTO SENSO 3 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 SESTO SENSO 3 with ASCOM and third party software. If you find any problem with your astrophotography software, enable the “Log communication” option in the SESTO SENSO 3 ASCOM properties and send us with en email to support@primalucelab.com the log files you will find under C:/ Documents/ASCOM

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

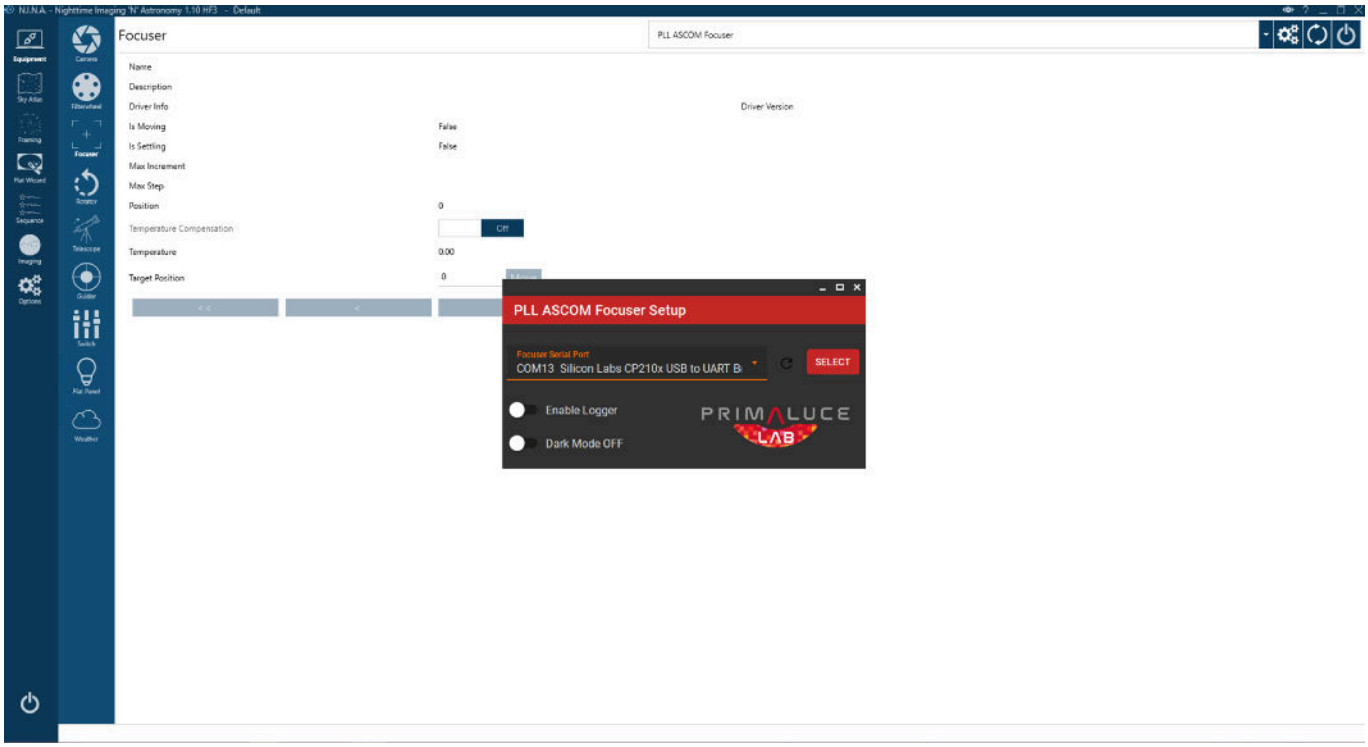


Start Sequence Generator Pro and, in the Equipment profiler, select "**PLL ASCOM Focuser**" then click on the first icon to the right. This will open a new window asking for the COM port number. Select the COM port related to SESTO SENSO 2 and press the **SELECT** button.

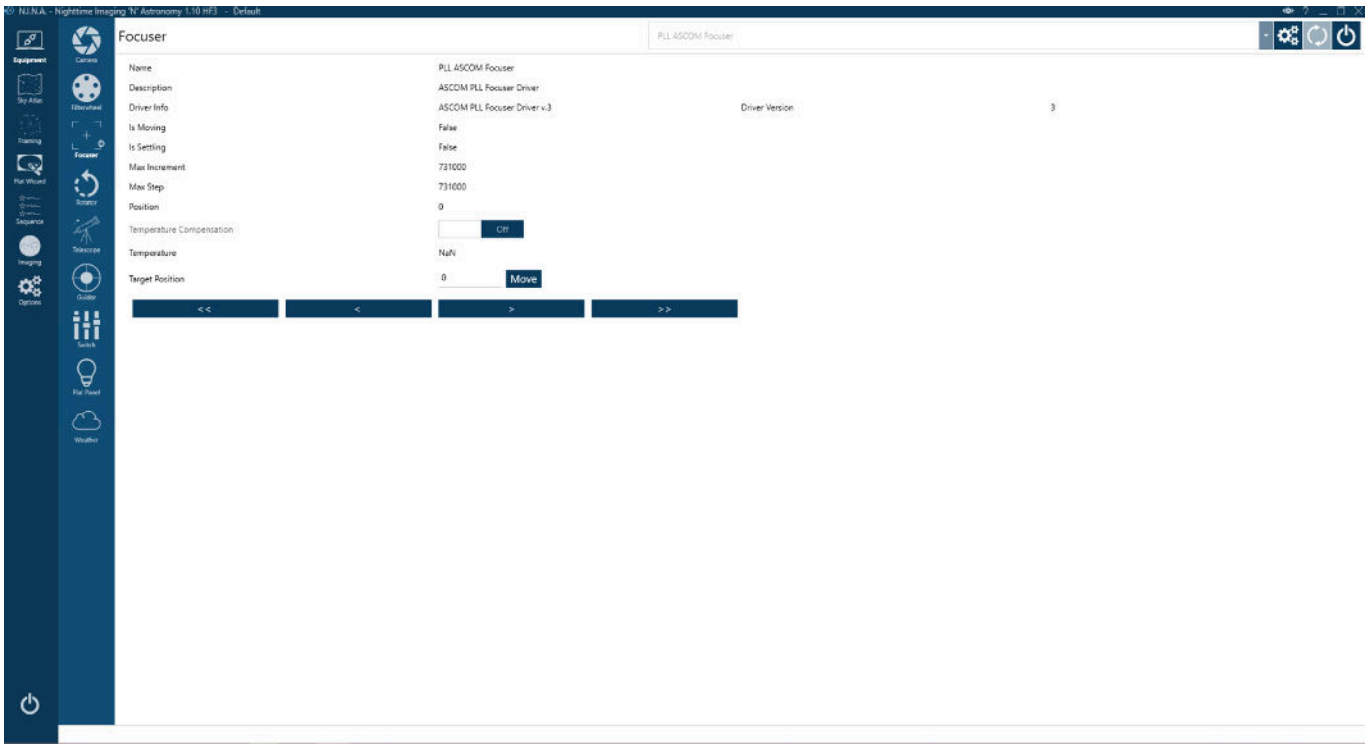


This will start the connection to the SESTO SENSO 3 and you will see position, temperature (if you connect the optional temperature probe) and movement buttons in the "Focus Control" tab.

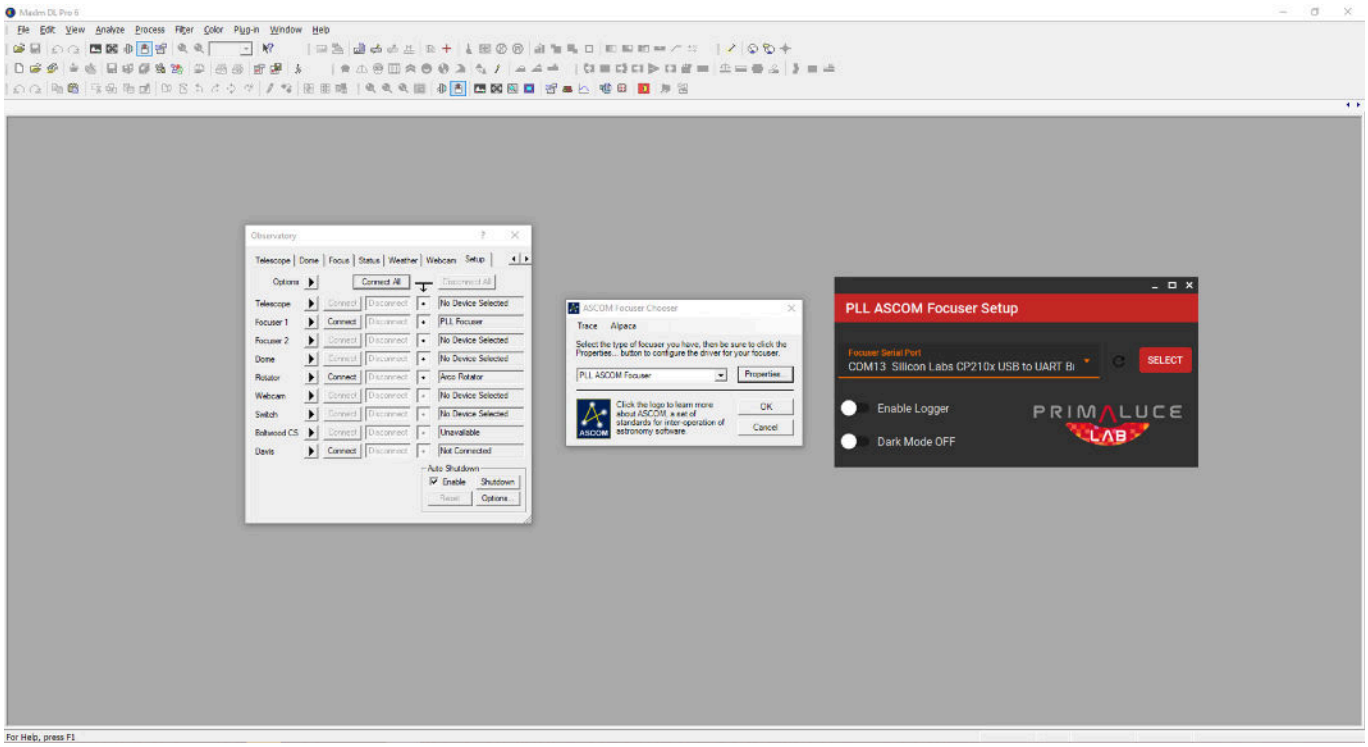
2) ***N.I.N.A.***: https://nighttime-imaging.eu



Select the "**Equipment**" tab, select "PLL ASCOM Focuser" then click 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 SESTO SENSO 3 and press the **SELECT** button. Finally, press the connect icon in N.I.N.A. to start the connection to the SESTO SENSO 3 and you will see position and temperature (if you connect the optional temperature probe).



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



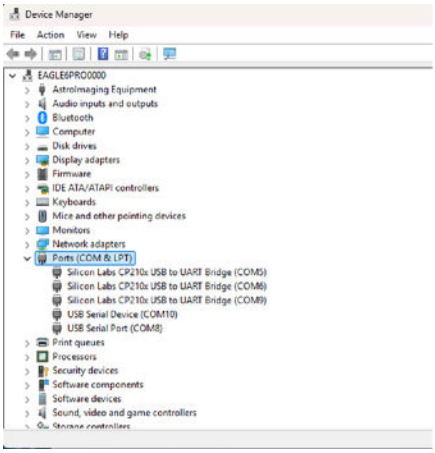
Select “**Observatory**”, click on the ▸ button to the right of “**Focuser**” and select “**Choose**”. In the new window select “***PLL ASCOM Driver***” and click on “**Properties**”. This will open a new window asking for the COM port number. Select the COM port related to SESTO SENSO 3 and press the **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 SESTO SENSO 3.

Using SESTO SENSO 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 SESTO SENSO with N.I.N.A.

Connecting SESTO SENSO to N.I.N.A



1. Install the latest stable version of N.I.N.A. from the link above. Setup your SESTO SENSO as directed in the user manual.

2. Disconnect the SESTO SENSO 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.

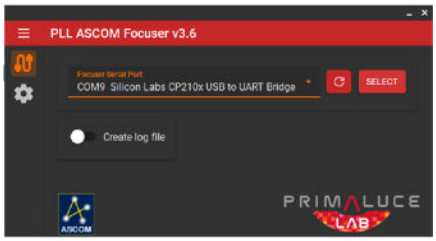
4. Connect your SESTO SENSO via USB and take note of which COM port appears in the device manager. Jot it down as you will need it later.

5. In N.I.N.A., go to the Equipment tab and select Focuser.

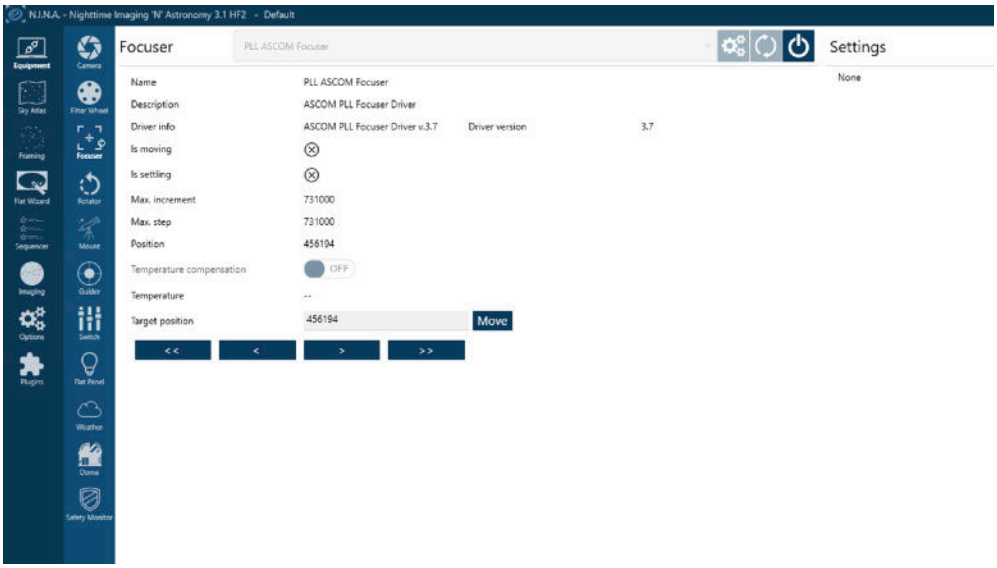
6. Choose the 'PLL Focuser vx.x (ASCOM)' from the drop-down list.

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 SESTO SENSO 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 SESTO SENSO 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.

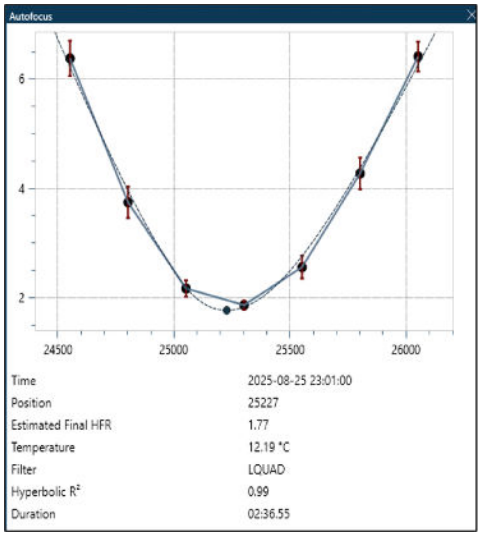
1. Ensure that focuser is connected to power (red power light indicates power).
2. Ensure USB is connecting. With Windows Device Manager open and the PORTS section expanded, confirm that the focuser connection appears and disappears when you plug in and unplug the USB cable. Write down the COM port number 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.

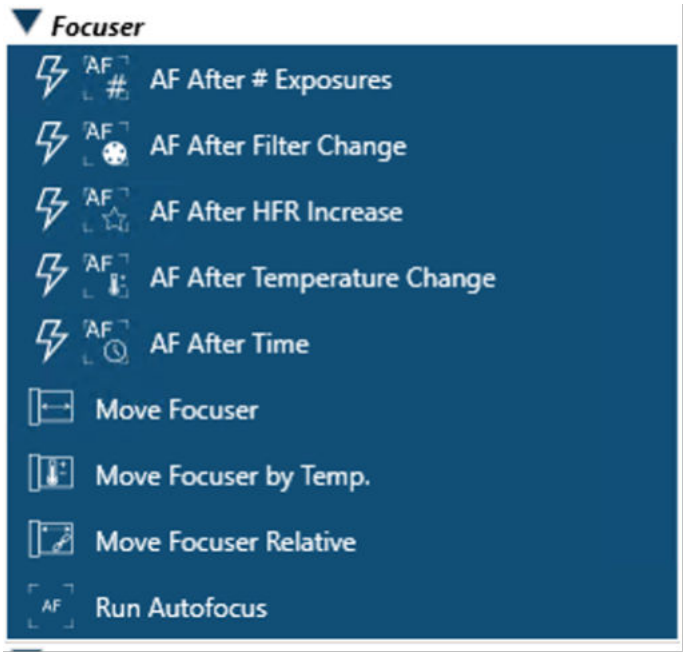


Move the focuser position out far enough that you can see that the stars are very slightly out of focus. Note the focus position. Use the difference between focused and unfocused positions as your Autofocus Step Size. For SESTO SENSO, try an Autofocus Step Size of 500. Suggested starting values for other 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 SESTO SENSO



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 SESTO SENSO 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

Troubleshooting

Q: I connected my SESTO SENSO 3 to my computer and 12V power, but when I start PLAY it doesn't connect.

A: After selecting the COM port of your SESTO SENSO 3 focusing motor in PLAY, please make sure to press the "Connect" icon. If it still does not connect, the issue may be related to the USB-C cable. Try replacing the USB-C cable with another one and reconnect the SESTO SENSO 3 to the same computer. Then open the Windows Device Manager and check under "Ports (COM & LPT)" that the "Silicon Labs CP210x" driver is correctly loaded. If the USB-C cable is working properly, the driver will appear and you will be able to connect using the PLAY software.

Q: I connected SESTO SENSO 3 to my computer, but it doesn't move and the PWR LED is blinking.

A: A blinking PWR LED means that the SESTO SENSO 3 is either not receiving 12V power (the device cannot operate without it) or it requires calibration. If the unit has already been calibrated but the LED still blinks, please make sure it is properly connected to a 12V power source.

Q: My SESTO SENSO 3 is connected and correctly 12V powered, but the PWR LED still blinks.

A: The PWR LED also blinks when the SESTO SENSO 3 is not calibrated. Please use the CALIBRATION button in the control software to start the calibration process with your focuser.

Q: The focus position in steps changes over time. When I return to a previously stored step value, the image is not in perfect focus anymore.

A: SESTO SENSO 3 connects to the micrometric (fine) knob shaft of your focuser, so the focuser's internal reduction system (usually 1:10) is part of the transmission chain between the motor and the drawtube. The SESTO SENSO 3 encoder reads the rotation of its own internal shaft, which means it measures what the motor does, not what the drawtube actually does. If the reduction system slips even slightly, the drawtube moves less than the motor commands, and the step value reported by the software gradually drifts away from the real drawtube position.
This does not prevent you from reaching focus: the autofocus routine will still find the correct focus position, because it evaluates the star size in the image and not the step number. What changes is the step value associated with that focus position, which can be different from one session to another, or even within the same session after a long sequence of movements.
The effect becomes more evident when a heavy imaging train (camera, filter wheel, off-axis guider) is installed, because the additional load increases the torque required at the reduction system, and with fast focal ratio telescopes, where the depth of focus is small and even a limited drift is visible.
To minimise this behaviour:

1. Check the user manual of your telescope to see how the micrometric reduction of your focuser can be mechanically adjusted, and adjust it to reduce slippage as much as possible. This adjustment is specific to your focuser and is not performed on SESTO SENSO 3.
2. Reduce the movement speed of SESTO SENSO 3: in PLAY software, click the ADVANCED SETTINGS button in the Focuser configurator and set Acceleration, Run and Deceleration to lower values under Speed Settings. Lower speeds reduce possibility of slippages.
3. Verify that the drawtube travel is smooth over its full range and that the focuser is not carrying more weight than it is designed to support.

Please note that this is a characteristic of the focuser's mechanics and not a malfunction of SESTO SENSO 3. Focusers differ significantly in machining quality and in the design of their reduction systems.

Q: My SESTO SENSO 3 focuser doesn't connect with ASCOM drivers.

A: The SESTO SENSO 3 has been tested with ASCOM Platform 7 or later. When using third-party software to control SESTO SENSO 3 through ASCOM, please make sure you are running at least version 7 of the ASCOM Platform. If the focuser still does not connect, first verify that you can control it with PLAY. If PLAY connects but the third-party software does not, please check that the PLL Focuser ASCOM driver is configured with the correct COM port number (the same one you use in PLAY). Also note that you cannot connect to SESTO SENSO 3 simultaneously with both PLAY and third-party software. Only one program can be connected at a time.

Q: When I connect SESTO SENSO 3 to PLAY, I can't connect it to another software.
A: This is normal. Once SESTO SENSO 3 is connected to a software, it cannot be used by another program at the same time because the serial connection can only be established once. If you want to use SESTO SENSO 3 with different software, please disconnect it from the first program before connecting it to the next one.

Q: When I connect an external temperature sensor to my SESTO SENSO 3, I get incorrect temperature readings.
A: All external temperature probes are tested in our laboratory before shipment. If you see an abnormal value in the External temperature field of the PLAY software, the probe may have a hardware issue. Remove the temperature probe jack from the SESTO SENSO by pulling the probe cable (and not holding the jack between your fingers), the internal cables may come loose from the connector. Unscrew the red part of the probe from the jack and check that the probe's internal wiring have all electrical wires connected to the connector. If you find one or more wires detached from the connector, you can reconnect them using a simple soldering iron.

Q: When I start my autofocus routine, the focusing graph looks flat instead of forming a V-curve.
A: This usually happens when the step size set in your autofocus routine is too small. The correct step size also depends on your focuser, so you may need to experiment with different values. As a starting point, considering the SESTO SENSO 3 resolution of 0.7 microns per step, try setting the step size to around 500.

Q: When I use the autofocus routine in a third party software (like NINA), the focuser shows irregular step movements and the reported position diverges from the real movement. The same focuser works perfectly in PLAY. What can I do?
A: This behaviour can happen in some configurations when the third party software is connected directly to the "PLL Focuser (ASCOM)" driver, and it can be related to the very frequent requests the software sends to the driver during the autofocus routine. The focuser itself is working correctly, as confirmed by the normal behaviour in PLAY. In this case, 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 of your software, 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.

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 authorised 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.