



Astrel Instruments

AST492

GETTING STARTED

rev A

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Getting started with the Astrel Instruments camera

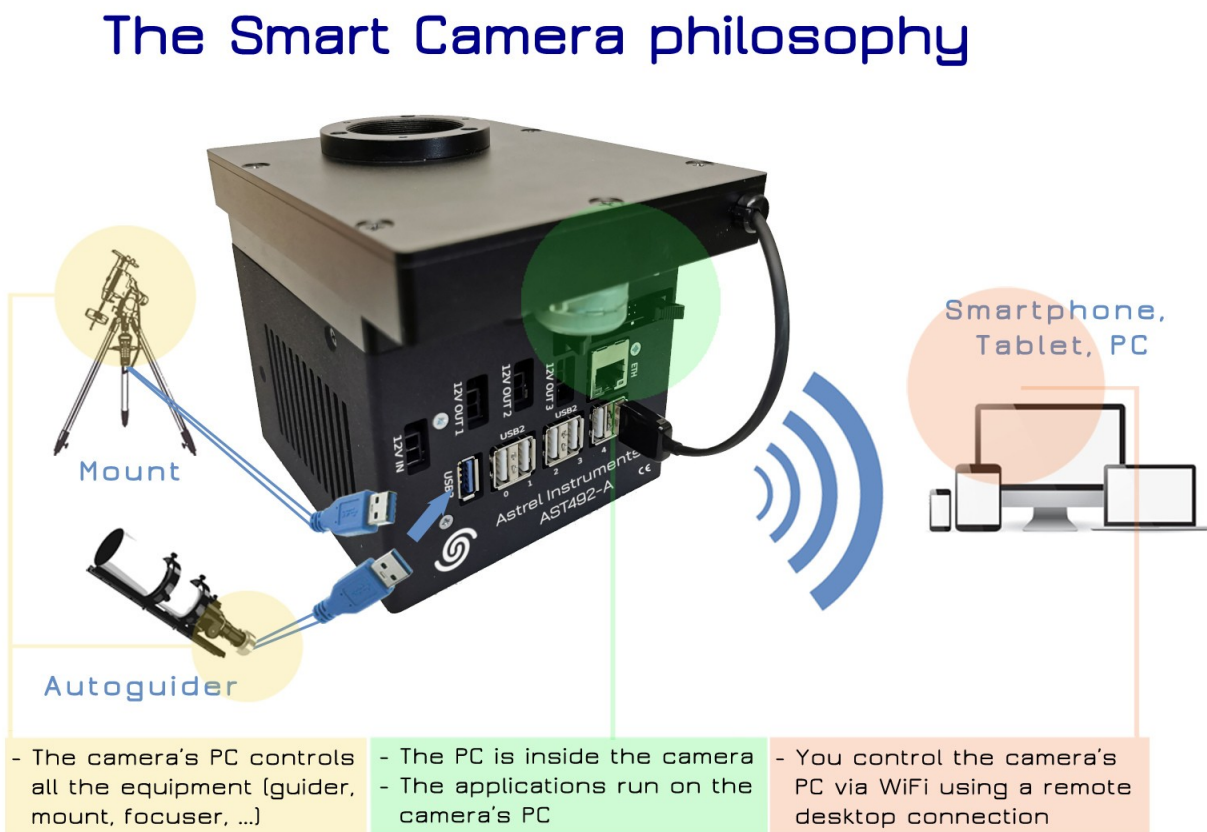
Thank you for purchasing an Astrel Instruments CMOS camera. Your new camera is a leading edge scientific instruments: please take your time to read carefully the following User's Manual to learn how to get the best out of your equipment.

The Smart Camera philosophy is the concept that the imaging camera could be the real brain of your astronomical equipment. This is possible thanks to the powerful microprocessor that is in charge of managing not only the camera itself but also, through the USB ports available on-board, the other components of your system.

When you power on the camera, you're also powering on an embedded PC, which can substitute the laptop that is needed to operate a classic camera for astrophotography. The embedded PC comes with the camera and filter wheel ASCOM drivers already installed, so that every software for astrophotography you will install could access them as usual.

Moreover, instead of connecting your setup (focuser, mount, autoguider, ...) to a laptop, you can connect it directly to the camera, so that, when connecting through WiFi, the only cable leaving the telescope is the main power supply.

To operate the camera without a laptop, you need to connect through WiFi with your tablet or even your smartphone using any Remote Desktop application (of course you can also use an external PC/laptop using Ethernet or WiFi).



Camera connections

The following picture shows the I/O interfaces available:

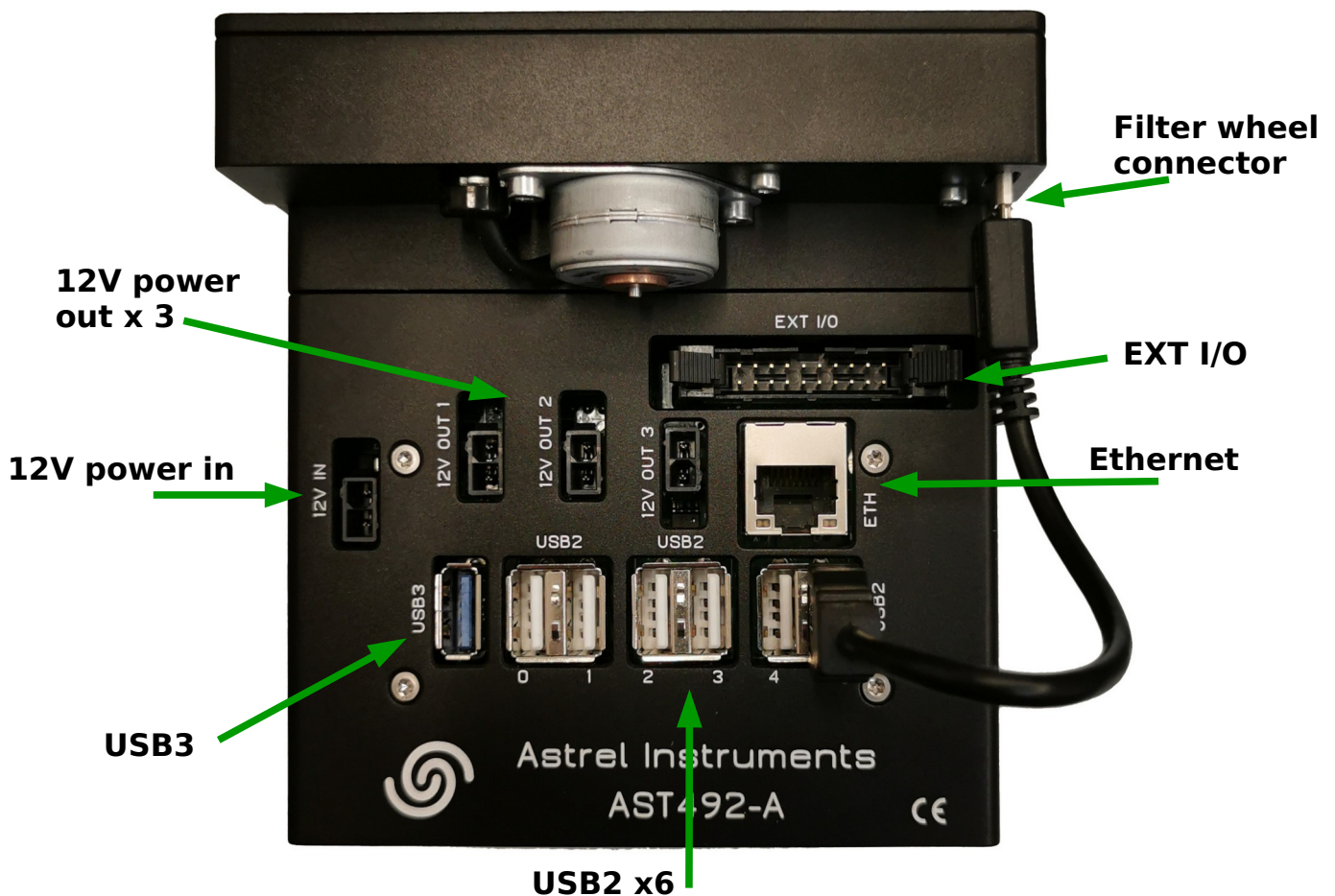


Figure 1: AST492 connectors

The following connectors are available on the camera:

- **12V power in:** the camera needs a 12V 5A power supply
- **12V power out:** 3x 12V power out connections for powering external equipment
- **USB2:** 6x hi speed USB connectors can be used to connect devices like wifi pen (included), focusers, mounts, keyboards and mice. Each USB port can drive max 500 mA. Port 5 is dedicated to the filter wheel
- **USB3:** 1x super speed USB3 connector for faster devices like guide cameras and USB dongles
- **Ethernet:** gigabit Ethernet port for PC connection
- **EXT I/O:** large number of configurable discrete I/O lines

Powering up the camera for the first time

First of all, connect the short USB cable to the filter wheel connector (see Fig. 1) and to USB port 5 on the camera. Connect the power cable to the 12V power in connector on the camera and to the power supplier, then connect the power supplier to a power plug: the camera's internal PC boots the Windows 10 operating system. No HDMI or other monitor connections are available on the camera: the desktop shall be accessed through the Remote Desktop application available on every Windows PC. First of all, connect the camera to the PC using the included Ethernet cable and open remote desktop on your PC (allow 40s / 1min fo the camera to complete the boot process before attempting to connect).

In the Remote Desktop application, insert 10.42.0.11 as address, *astro* as username and *astronomy* as password, then click connect to access the camera. After the connection is established, you will be presented the AST492 desktop, which is a standard Windows 10 desktop, exactly like any other PC.

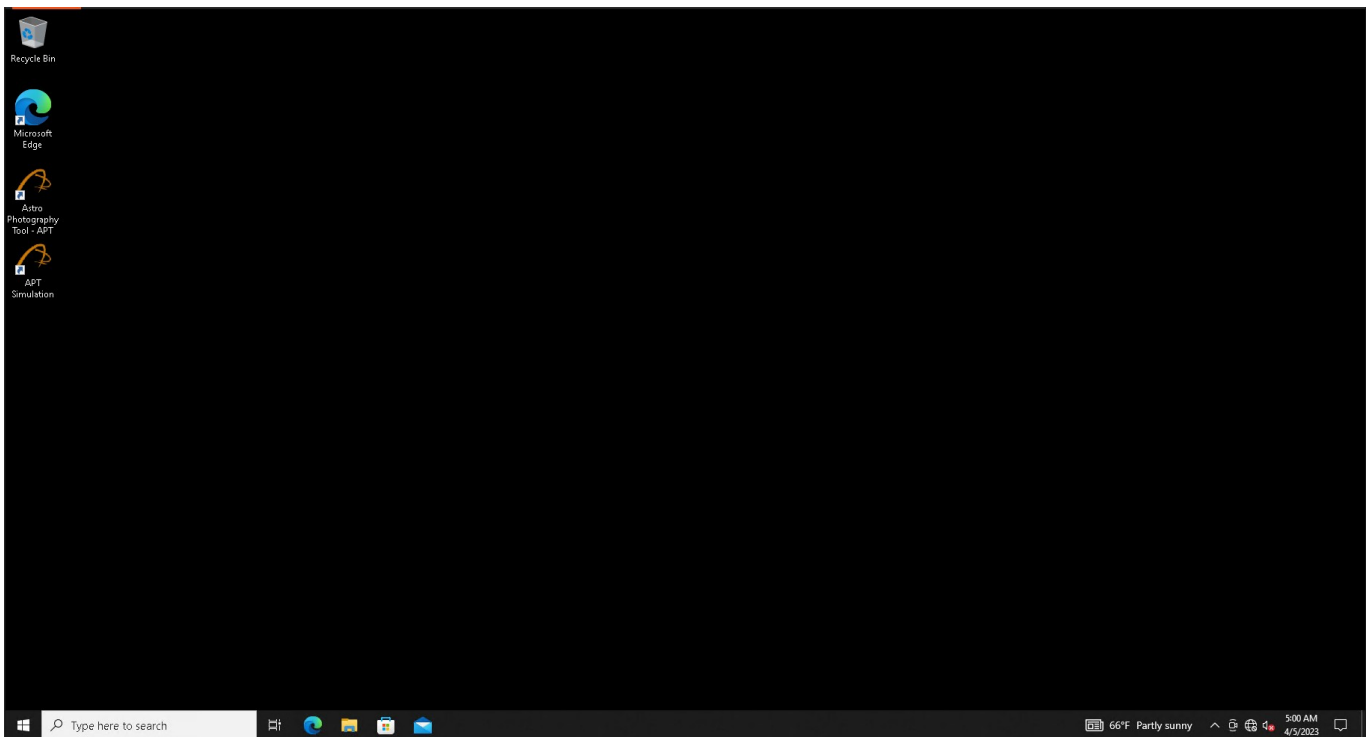


Figure 2: The AST492 Windows 10 desktop

The following applications come preinstalled on the camera:

- 1) ASCOM platform
- 2) ASCOM drivers for AST492 camera and filterwheel
- 3) APT (Astro Photography Tool), a very well known astrophotography software, that can be used to take pictures with the camera and control all your equipment

To test the correct behavior of the camera, start APT using the icon on the desktop. APT should

start, automatically connect to the AST492 camera and ask for setting the local coordinates: say no, you could set it later, then click the 'shoot' button to take a picture. The camera exposes for 1 second and downloads the image: depending on the light entering the camera, you could need to stretch it using the histogram tool on the lower left.

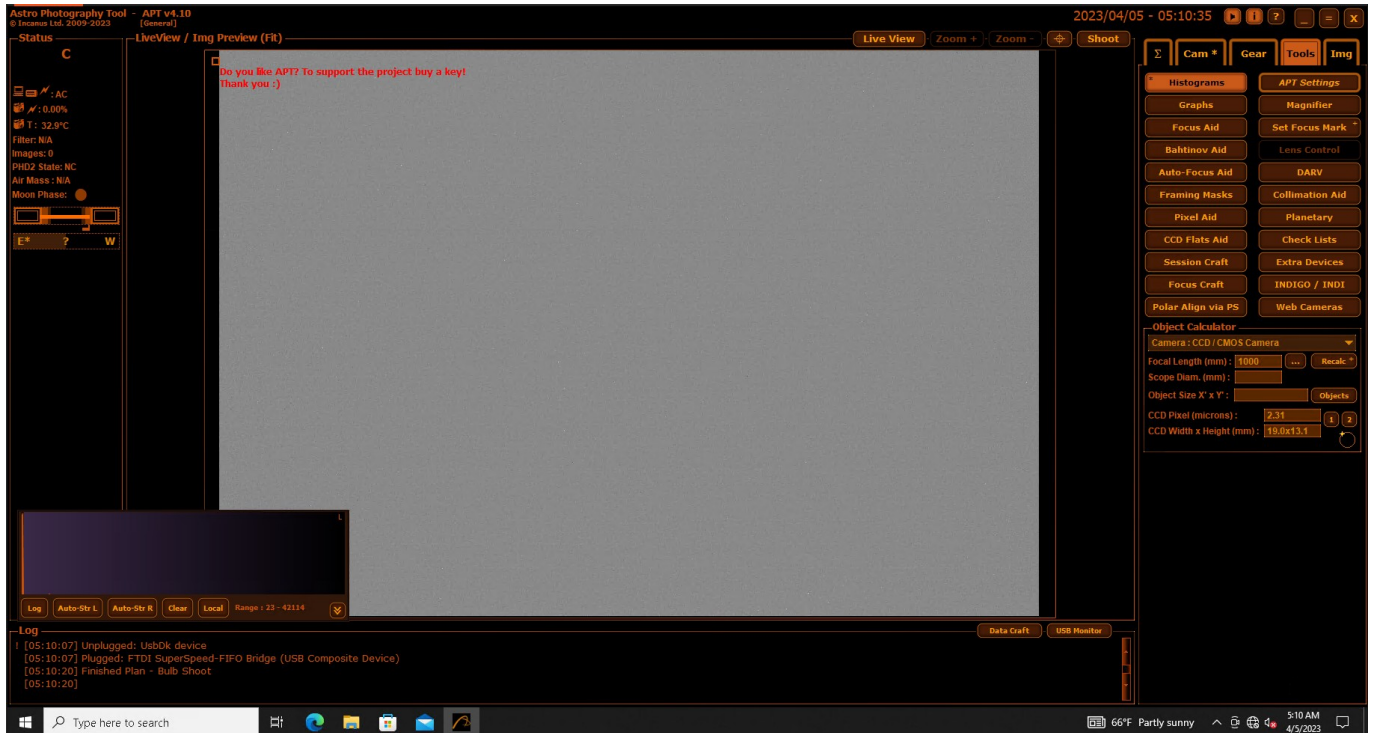


Figure 3: Running APT

Then go to the 'gear' tab and click 'connect wheel'. The wheel should connect and show that it is on the R (meaning Red) filter. The APT filter names are set like the following (see *Filters mounting procedure* below):

- Position 1: filter L (Luminance)
- Position 2: filter R (Red)
- Position 3: filter G (Green)
- Position 2: filter B (Blue)
- Position 2: filter Ha (H-alpha)
- Position 2: filter SII (Sulfur II)
- Position 2: filter OIII (Oxygen III)

Click 'go to filter', select 'B' and verify that the wheel is moving of 1 position counter clock wise.

If you come to this point without problems, congratulations: the camera is working correctly.

Next steps would be to connect your equipment to the ports of the AST492 (autoguider, telescope, focuser, GPS, ...) and read the APT manual in order to understand how to deal with your setup and start taking pictures!

Of course you can install whatever software you prefer on the AST492: the camera and the filter wheel have ASCOM drivers that can be used to interact from a different astrophotography tool.

Powering down the camera

WARNING: avoid powering down the camera by simply disconnecting power supply: your camera has a true PC inside running Windows and, as any other PC, you should shut it down in the correct way. After shut down the camera will disconnect from the remote desktop: wait for 1 minute before unplugging the power cable to allow the shut down to terminate.

Using the WiFi connection

If you connect the included WiFi pen to one of the camera's USB ports **before powering up**, the camera will act as a WiFi hotspot, creating the 'ast492hotspot' WiFi network: you can connect using any WiFi enabled device just selecting this network and entering the password 'ast492hotspot'. After the connection is done, you can use the Remote Desktop application as described above but using the address 192.168.137.1

If you need to connect the camera to your home WiFi router (for example to access the Web), power down the camera, remove the WiFi pen and restart. Once the boot is completed, connect to the camera (of course you have to connect to the camera using the Ethernet cable as described in the previous paragraph), insert the WiFi pen and connect to your home router as usual.

To get back to the hotspot modality, power down the camera and restart with the WiFi pen inserted.

As a good rule, try to avoid installing too much non astronomy-related software, keeping in mind that the stability of the system is of maximum importance when doing astrophotography!

Using the vacuum pump

The camera adopts a low vacuum approach to avoid frosting on the CMOS glass. Using the included vacuum pump, you can remove the air from inside the camera, so that there's no more water vapor to freeze. Moreover, reducing the air inside the camera minimizes the heat exchanges due to convection, so the optical window never get too cold due to the low CMOS temperature. The included pump is typically able to reach about **25-26 inHg** vacuum in less than a minute of operation, but anything above 24 inHg is enough. The vacuum pump gauges have a tolerance of about +/- 1 inHg, refer to the "Important Notice" sheet provided with the camera to get the proper vacuum level to be set before cooling the camera. The camera is tested to maintain a vacuum better than 24 inHg for at least two days and it's not unusual for cameras to last for weeks, so there's no need to operate the pump during a photo session.

Always keep the vacuum valve closed even when the camera is not working. When the camera is not used for long periods, it is advisable to put it into an air tight envelop.

WARNING: never get the camera below the freezing temperature without evacuating it to an acceptable vacuum level: you will run the risk of frost creation on the CMOS glass and even produce a permanent damage to the camera.

Filters mounting procedure

This paragraph describes the complete procedure to be followed to mount the filters on the integrated filter-wheel. The wheel uses standard 1.25" mounted filters or 31mm unmounted filters.

The AST492 is equipped with a 7 positions filter wheel. Position number 1 is referenced by a small white arrow near the hole, which points to the direction where position 2 is located.

**Arrow
indicator**



Figure 4: Filterwheel box internal

WARNING: Do all the following operation in a clean ambient in order to minimize dust entering.

1. Remove the six screws locking the camera top plate in order to access the filter wheel

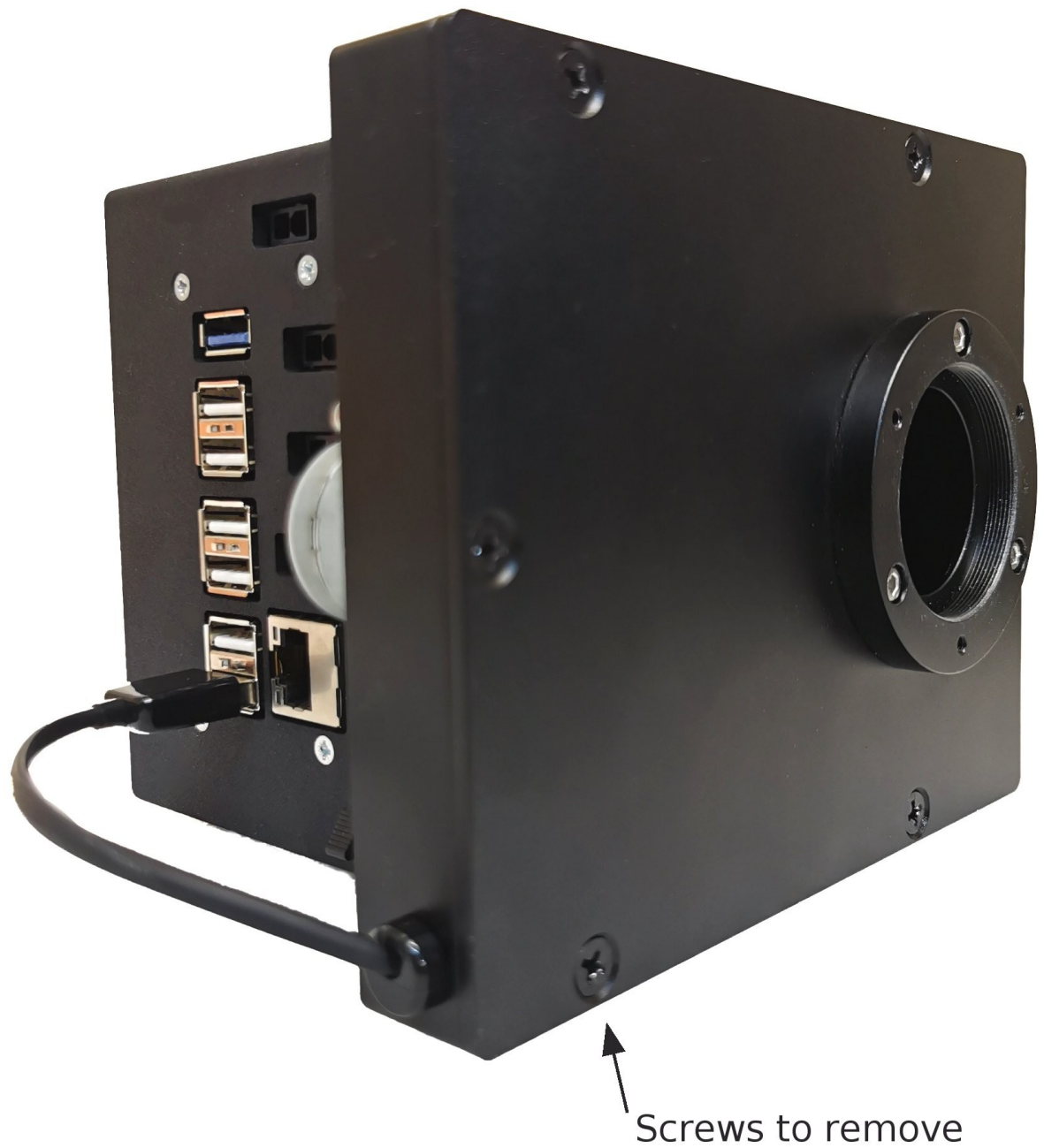


Figure 5: filterwheel box external

2. Locate the small white arrow to find position 1 filter
3. Screw filters in the wheel holes in this (non mandatory) order:
 - Luminance
 - Red
 - Green
 - Blue
 - H-alpha
 - SII

- OIII

This is the order that is preset in the APT application: if you need a different order, remember to change it also in the ATP application.

WARNING: do not push the wheel down while screwing to avoid any tilt of the wheel on its axis: to properly operate, the wheel has to stay parallel to the filter wheel box floor

4. Before mounting the last filter, remember to check if you have to clean the optical window in front of the sensor
5. Put the camera top plate back in place and fix it with the six screws.

The positions of the filters are precisely aligned with the camera sensor in factory, but, if needed, it can be fine tuned by modifying the file *filterwheel.dat* located in the C:\Users\astro\sw_astrel\bin\apps folder. This file contains a list of numbers representing the following data:

<position 1 offset>

...

<position 7 offset>

<calibration position length>

where *<position n offset>* is a number representing the additional number of motor steps in order to have the filter perfectly centered with the sensor. By changing this number you can modify the final position of the filter: the bigger the number, the longer the movement.

WARNING: do not change *<calibration position length>*, which is set in factory to the correct value, changing it could lead to filter wheel operation failure.