Camera Adapter System

User's Manual

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Overview

The Apertura Camera Adapter System (APT-CAS) allows you to easily attach an astronomy camera to your telescope and takes the guesswork out of many common imaging setups. This kit gives you the pieces necessary to reach focus with most telescopes and corrective elements that are designed around the industry standard 55 mm back focal distance. It works with most common cameras; with and without many of the popular accessories like Off Axis Guiders, Filter Wheels, and Filter Drawers. This kit even includes an adapter to allow for imaging with 1.25” filters, without the need for any other accessory!

To get your imaging setup up and running as quickly as possible, this manual includes Apertura’s exhaustive specifications, diagrams on how to use your kit with a number of common cameras and optical train accessories; as well as information on calculating spacing for less common setups.

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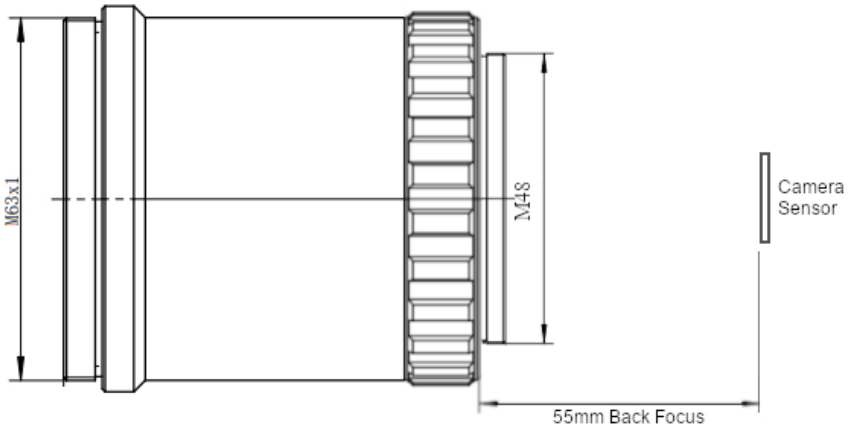
Using the Kit

Backfocus

In simple terms, the optics inside a telescope take light rays and focus them to a point; resulting in a focal plane where the image is formed. Where this focal plane sits is determined by the optical components and design of the telescope, and in order to capture the best well corrected image being formed, the camera sensor needs to be at that specific plane.

As observing and imaging accessories alike will all have varying distances that they set eyepieces or sensors at, telescope designs will not set the focal plane at the physical end of the instrument. Instead it will be set some distance to the back of this, and that distance is what is being referred to when discussing backfocus[1]. This is typically only mentioned when corrective optics are used, such as field flatteners, focal reducers, or coma correctors. However, you will also experience this on telescopes with integrated corrective optics - such as with Celestron's Edge HD series.

Setting the camera's sensor at the correct backfocus point is where spacers come into play. This guide does include some common configurations in the template diagrams to take the guess-work out of things, however understanding how this is calculated can be helpful for adding to a setup, changing one, or otherwise navigating a configuration not covered here. For more information on calculating spacing, refer to the appendix at the end of this guide.



[1] Fun Fact: The most common backfocus distance today, 55 mm, and the term "T-ring" come from the film days of astrophotography.

Camera manufacturers at that time (and still to this day) designed their own lens with different backfocus distances, which is referred to as the flange distance in that space. In 1957 Tamron sought to unify these by designing their lens mount with a flange distance longer than most all other brands, which meant their lens could be used on other brands with a simple spacer; and were another optics designer to adopt this mount, their optic would be similarly universal.

Tamron's mount was named the T-mount, and it utilized an M42x0.75 connection with a 55 mm flange distance.

Kit Contents

Adapters

1. M42 to 1.25” Filter Adapter
2. M42 to M48 Adapter

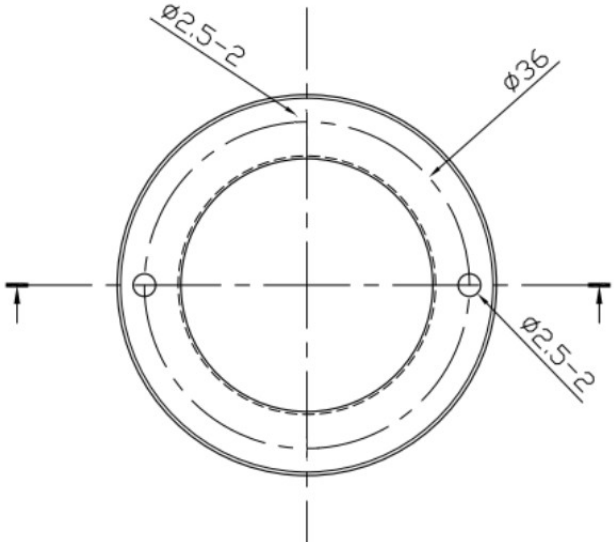
Spacers

1. 16.5mm M42 to M48 Adapter/ Spacer
2. 21mm M42 to M42 Spacer
3. 1mm M42 Spacer
4. 1mm M48 Spacer
5. 5mm M42 to M42 Spacer

Adapters

M42 to 1.25” Filter Adapter

1. M42 External Threads
    a. Length of Threaded Section: 3mm
2. 1.25” Filter Internal Threads
    a. Length of Threaded Section: 3mm

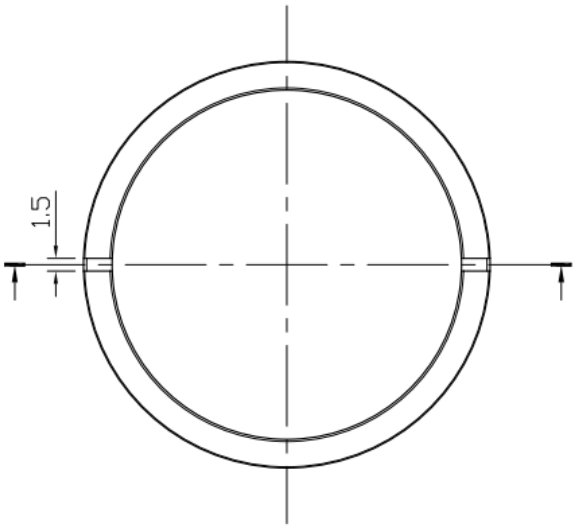


This adapter can be used to install an 1.25” filter in the optical train; with a good number of astronomy cameras having sufficient space to allow for this to rest directly in front of the sensor window, even when installed on a scope. This can also be installed into the front of the 21mm spacer.

M42 to M48 Adapter

1. M48 External Threads
    a. Length of Threaded Section: 4mm
2. M42 Internal Threads
    a. Length of Threaded Section: 4mm

This adapter allows for conversion of an M48 female connection to an M42 female connection, or conversely conversion of an M42 male connection to an M48 male connection.

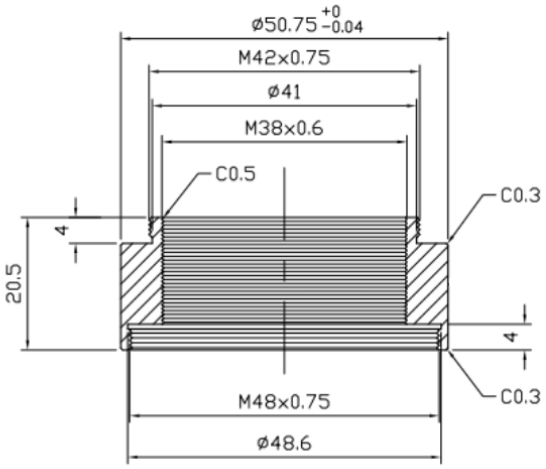


Spacers

16.5mm M42 to M48 Adapter/ Spacer

1. M42 External Threads
    a. Length of Threaded Section: 4mm
2. M48 Internal Threads
    a. Length of Threaded Section: 4mm
3. M38 Internal Threads
    a. Length of Threaded Section: 16.5mm

★ Spacing Added: 16.5mm

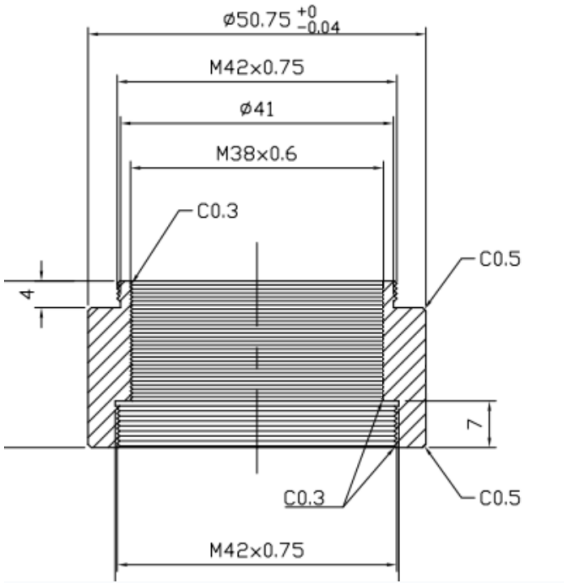


This spacer will add 16.5mm. It is designed to thread onto the front of most telescopes with an M48 external threaded connection end to then connect to the end of most telescope optical trains. The external M42 threads are designed to interface with the 21mm spacer from this kit, which typically will also need to be installed between the 16.5mm spacer and the camera to reach focus.

21mm M42 to M42 Spacer

1. M42 External Threads
    a. Length of Threaded Section: 4mm
2. M42 Internal Threads
    a. Length of Threaded Section: 7mm
3. M38 Internal Threads
    a. Length of Threaded Section: 18mm

★ Spacing Added: 21mm

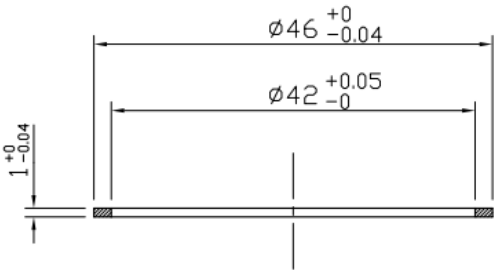


This spacer will add 21mm to the optical train. It will typically be installed between the camera and 16.5mm M42 to M48 spacer, though reference the diagrams later is this manual for the appropriate configuration for your camera.

1mm M42 Spacer

1. M42 Clearance Internal Section

★ Spacing Added: 1mm

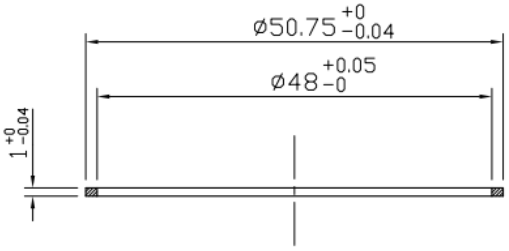


This spacer is designed to be placed on an external M42 thread, adding 1mm of space when this is then connected to a camera or other M42 internally thread component.

1mm M48 Spacer

1. M48 Clearance Internal Section

★ Spacing Added: 1mm

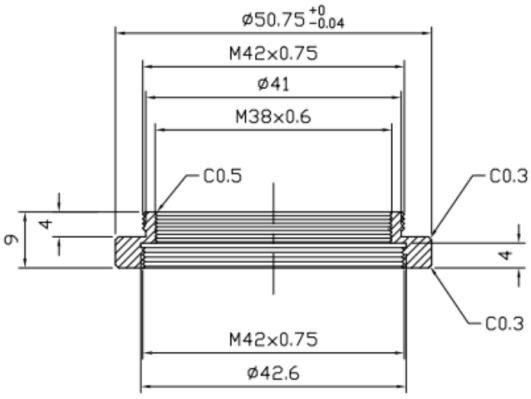


This spacer is designed to be placed on an external M48 thread, like the output of a telescope flattener, adding 1mm of space when this is then connected to the end of the 16.5mm M42 to M48 spacer.

5mm M42 to M42 Spacer

1. M42 External Threads
    a. Length of Threaded Section: 4mm
2. M42 Internal Threads
    a. Length of Threaded Section: 4mm
3. M38 Internal Threads
    a. Length of Threaded Section: 5mm

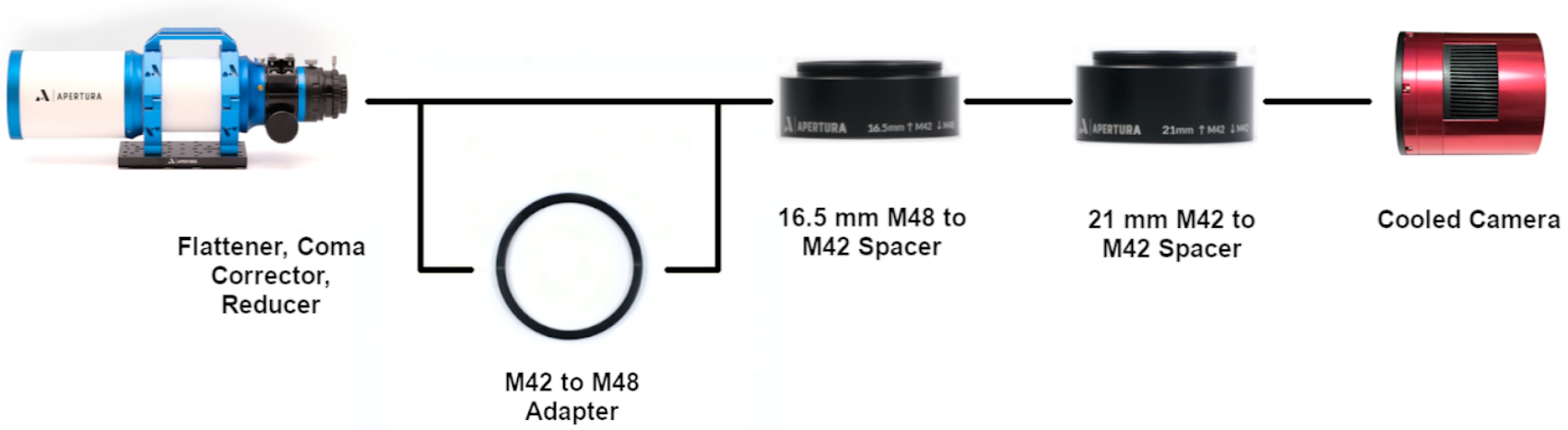
★ Spacing Added: 5mm



This spacer will add 5mm to the optical train. Typically this will be added into an uncooled camera spacing setup, as the majority of these cameras will have a native backfocus distance shorter than their cooled counterparts.

Use with Cooled Cameras

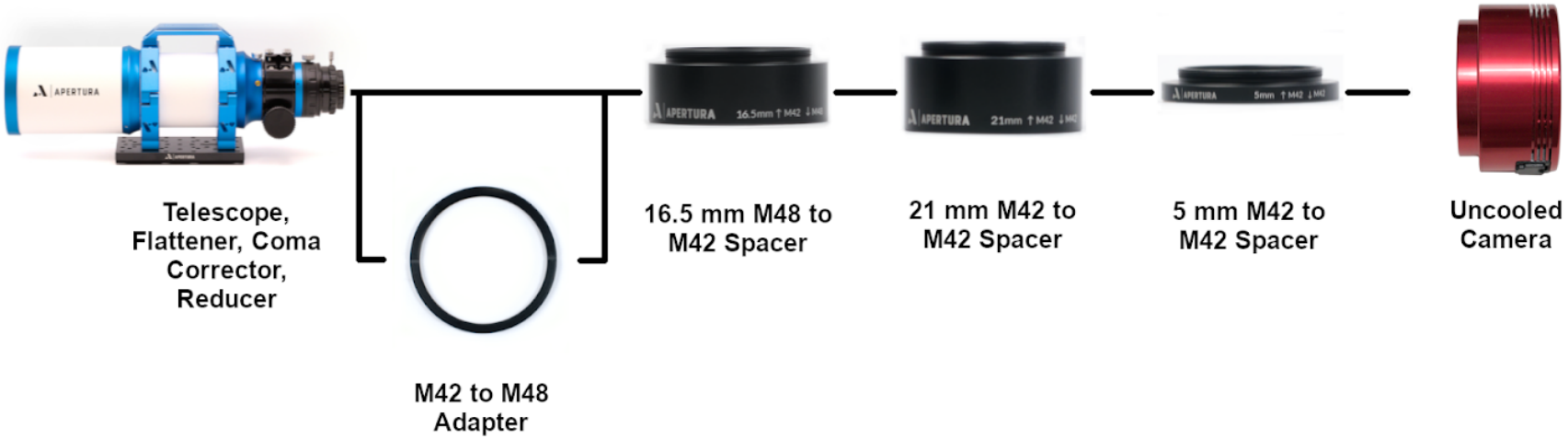
55 mm Backfocus with QHY/ ZWO Cooled Cameras



Note: Depending on the connection from the telescope or corrective element, the M42 to M48 adapter shown in these diagrams may or may not be needed.

Use with Uncooled Cameras

55 mm Backfocus with ZWO Uncooled Cameras



Filter Drawer

55 mm Backfocus with Cooled and Uncooled Cameras, and ZWO Filter Drawer

OAG

55 mm Backfocus with Cooled and Uncooled Cameras, and ZWO OAG

Filter Wheel

55 mm Backfocus with Cooled and Uncooled Cameras, and Select Filter Wheels

Note: The above scheme will work for ZWO's EFWMINI, EFW8X1.25, and EFW7X36 filter wheels; as well as the Orion 05522. Due to ZWO's filter wheel design, the included 2 mm T2 to T2 adapter will space this system out to 56 mm. In most cases this will be more than close enough to allow the camera to reach focus.

Using the M42 to 1.25” Filter Adapter

1.

2.

Installed in Uncooled Camera
Threaded Connection

Installed in Apertura
CAS 21 mm Spacer

The M42 to 1.25” filter adapter is made to thread into an internally threaded connection, such as the front connection of many dedicated astro cameras or the 21 mm spacer included with this kit.

To use in this manner, first install an 1.25” filter into the adapter as shown. Next thread the adapter into the front of the camera or adapter, utilizing the holes to help seat the adapter fully. Once installed, the camera can be connected and used as before!

Using the 1 mm Spacers

The 1 mm spacers add 1 mm of space to the optical train, which can help in situations where just *a bit* more spacing is required. As shown in the image above, simply place the 1 mm spacer on the male thread side and then attach any connecting part as normal.

Warranty

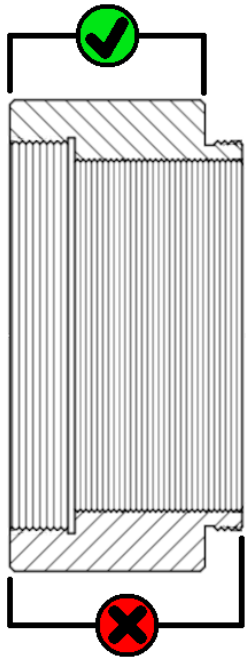
The *Apertura Absolute Warranty* provides two years of coverage against product defects. After the initial two-year warranty expires this product qualifies for Apertura's Three-Year SHARP coverage, an accidental replacement program. In addition, the Apertura Absolute Warranty is transferable! It is important to keep your original receipt and the product's original boxes and packaging, should you need to make a claim.

Appendix

Calculating Spacing

Calculating spacing is fairly straightforward, and essentially just entails accounting for the amount of space each item in the optical train takes up. Accordingly the first step to take for this calculation is to gather this specification or measurement for the items to be installed.

As discussed in the Backfocus section of this manual, the goal is to set the camera sensor at the focal plane. Now since cameras do not set the sensor directly at the front, the space between this and the camera connection does need to be accounted for. This is what is referred to as the **native backfocus distance** for the camera, and will typically be listed in the specifications by the manufacturer. As may have been inferred from the diagrams, this differs from camera to camera; though at present the majority of cooled cameras have a 17.5 mm native distance, and uncooled cameras 12.5 mm.



For items that will be installed in between the camera and the telescope, such as filter wheels, filter drawers, OAGs, etc., the amount of space these will take up is also often listed or otherwise shown in mechanical drawings. However if this is not present, it is easy enough to find - simply measure the thickness of the accessory from front to back. It is important to note when doing this that exterior threaded portions should not be measured (see diagram).

Once the native backfocus of the camera and the space any components will take up have been collected, these should be subtracted from the backfocus distance of the telescope or flattener/ coma corrector/ reducer to find the amount of space remaining:

$$Distance\ to\ be\ taken\ up\ by\ spacers\ =\ Backfocus\ of\ scope\ or\ optical\ element\ -\ Native\ backfocus\ -\ Accessory\ space$$

Once this distance has been calculated, you can then begin to select the set of spacers needed to make up that total distance!