Instruction Manual

Congratulations on the purchase of the new Omegon® Smartphone and Camera Adapter. This adapter is designed to hold most modern smartphones and digital compact cameras. It fits to most 1.25" telescope eyepieces making afocal high-power telescope astrophotography easy and fun. It can also be used with spotting scopes eyepieces for terrestrial afocal photography. This adapter allows precision mechanical to optical axis centring thus providing sharp pictures and giving consistent results.

1. Parts

The adapter consists of two main parts.

The **adapter's body** which is made from aluminium (figure 1) with its two built-in thumbscrews and threaded shafts to adjust the platform's (J – figure 1) position to the **smartphone bracket.** The bracket (M) securely holds a smartphone or a digital compact camera. Besides that, the two additional supplied ¼"-20 knobs (N) are used to fix the bracket (M) to the platform (J).

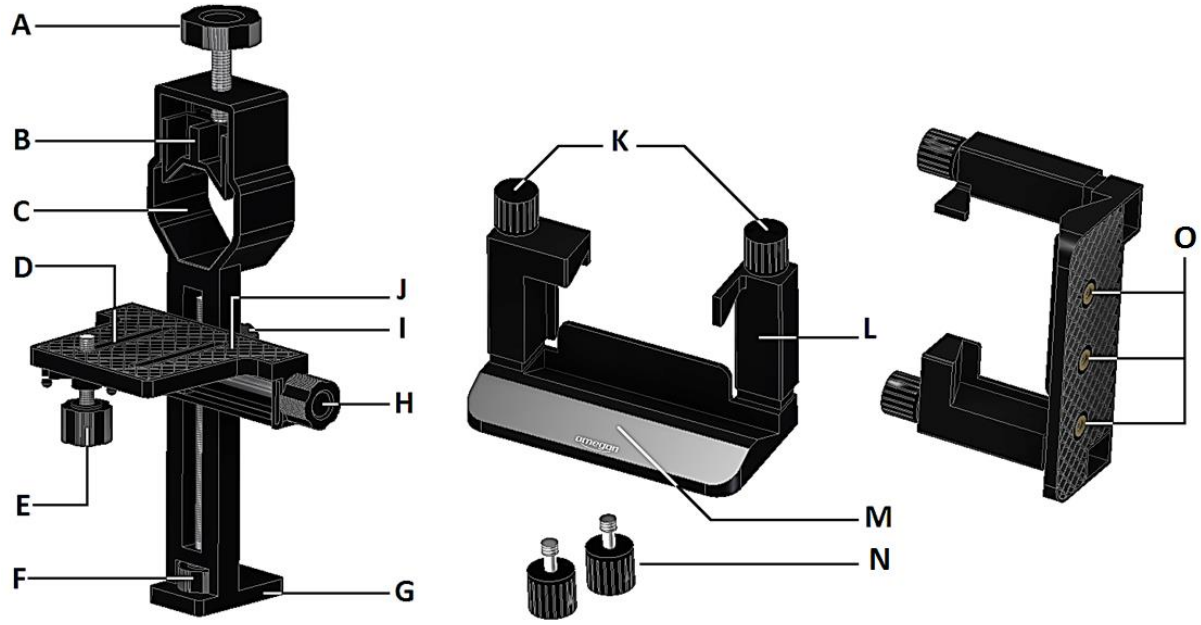

Figure 1.

A- clamp knob
B- clamp
C- eyepiece housing
D- slot
E- ¼"-20 three lobed knob
F- height adjustment knob
G- base
H- sideways adjustment knob
I- locking knob
J- platform
K- post knobs
L- post (left and right)
M- bracket
N- ¼"-20 knobs
O- ¼"-20 holes

2. What is afocal photography. The *Omegon® Smartphone and Camera adapter* is designed for afocal photography with a telescope. A camera or a smartphone captures the image formed by the telescope's eyepiece. This technique, called afocal photography, is very popular as it is very easy to do. The object centred in the eyepiece's field of view (FOV) - focused like you would do for visual use - can be photographed by a smartphone's camera or a compact camera. Although it is possible to take afocal photos by holding a smartphone by hand and reaching it close to the telescope's eyepiece, the results obtained with such a technique are usually mediocre. The hand is not a stable platform. In order to obtain consistent quality sharp images a rock solid platform is required. It is also important to align the camera's objective parallel to the eyepiece and that all optical axes are aligned. This is only possible by using an adapter that allows to finely adjust the position of the camera and fixing it to the eyepiece! The eyepiece should be a long eye relief eyepiece. These types of eyepieces, when compared to traditional eyepieces, create the focused image much farther away from the eyepiece lens itself, making it easier for the camera to photograph the complete FOV.

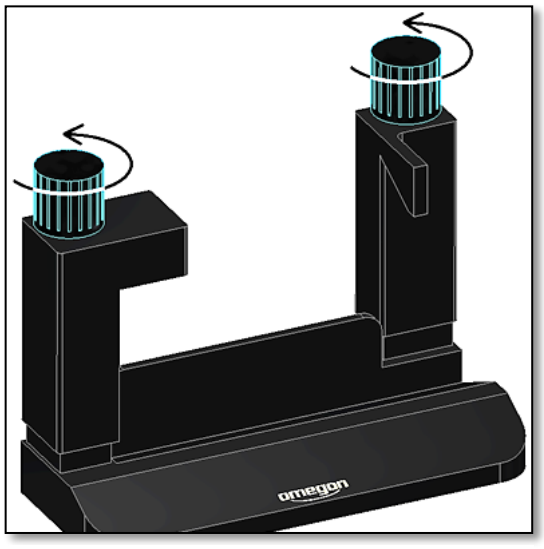

Figure 2. *Release the two Smartphone fixing knobs (I)*

2.1. Getting started. Start by releasing the two post knobs (K) - as shown in figure 1 - the internal built-in spring system will push the posts up allowing for the device to be slided-in. Make sure to release it so there is enough room for the smartphone to slide-in. Remember that the device's maximum width should not exceed 80mm. Sliding the device is easy but make sure the smartphone slides in the direction of the left L-shaped post

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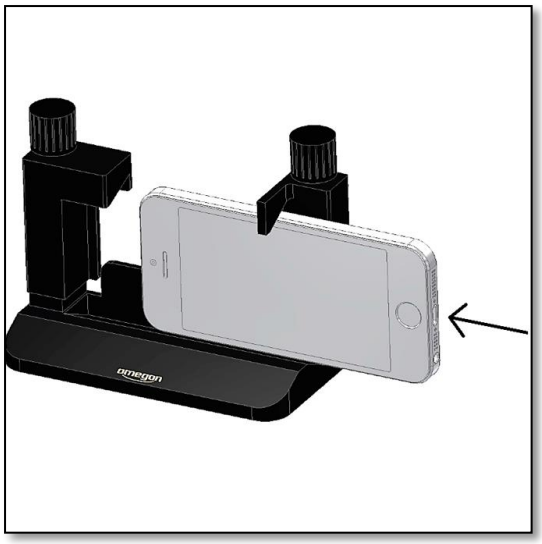

Figure 3. *Slide the smartphone making sure the smartphone slides to the left.*

Figure 4. *Tighten the two Smartphone fixing knobs (I) to securely fix the smartphone.*

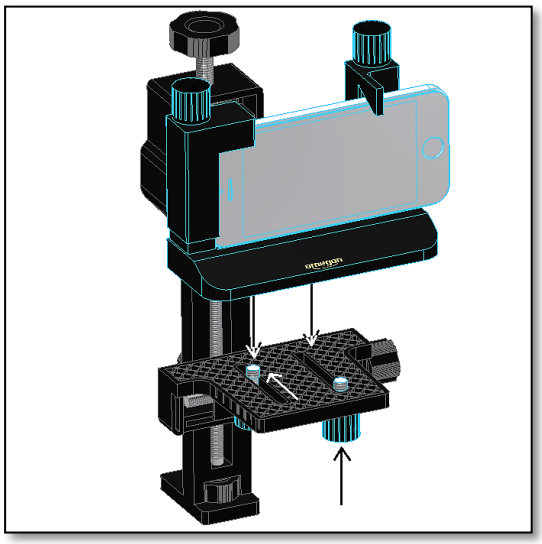

Figure 5. *Place the bracket (M) with the smartphone on the platform (J). Slide the ¼"-20 knobs and match it with the bracket's threaded holes.*

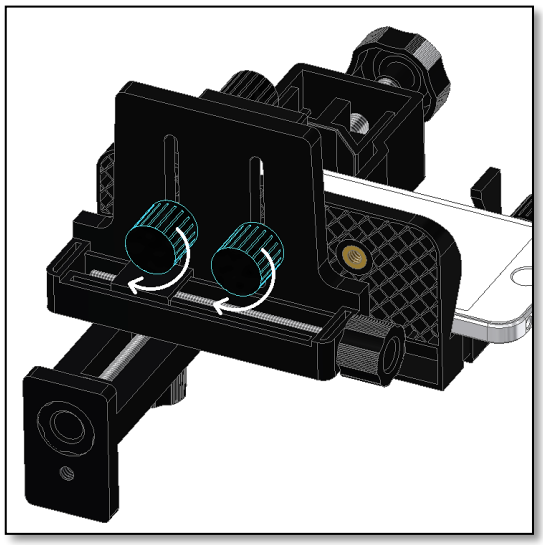

Figure 6. *Tighten the two post knobs (K) so that the bracket (M) is well fixed. The smartphone should be flush to the Clamp (B).*

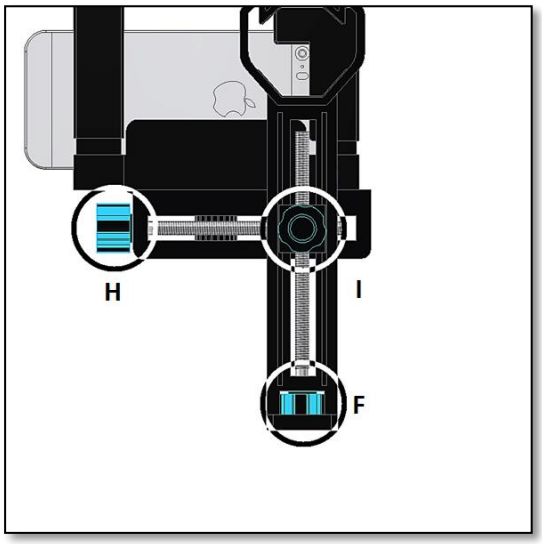

Figure 7. *Centre the camera in relation to the eyepiece housing (C) system by using the height, sideways and the fixing knobs.*

– figure 3. Now tighten the two post knobs (K) so that the device is securely fastened to the bracket (K) as shown in figure 4. Place the bracket (M) with previously secured smartphone on the platform (J) so that it is flush with the clamp (B) - figure 5. This is important because the distance from the eyepiece to the smartphone should be kept to a minimum. Thread and slide the ¼"-20 knobs (N) until the phone is at its closest position to the clamp. Make sure to tighten both as shown in figure 6. Next step is to adjust the smartphone's camera position so that is more or less centered to the clamp. At this point, it is not of extreme importance for both camera lens and clamp to be centred, but a rough centring is desirable. The clamp (B) will hold the telescope's eyepiece. Both the camera and eyepiece should be centred in relation to one another. The sideways adjustment knob (H) adjusts the smartphone position sideways while the height adjustment knob (F) adjusts fit up-down. Rotating these knobs only make small adjustments and several turns may be necessary to center the smartphone camera with the eyepiece housing (C).

Make sure that the locking knob (I) is released before adjusting the platform's position. The movements on both axes must also be friction-free. Locking is only necessary when the camera is centred to the eyepiece housing (C).

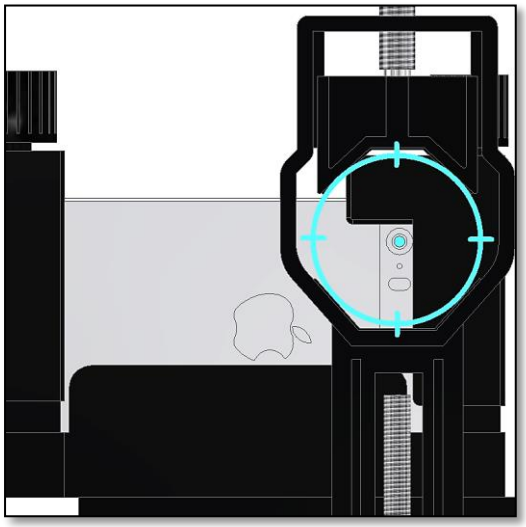

Figure 8. *A coarse centring between the eyepiece housing(C) and the smartphone's camera is important.*

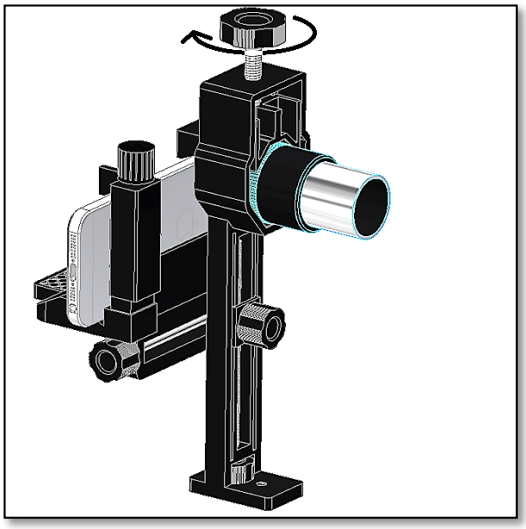

Figure 9. *Turn the clamp knob (A) to clamp the eyepiece.*

Figure 10. *A coarse centring between the clamp and the smartphone's camera is important.*

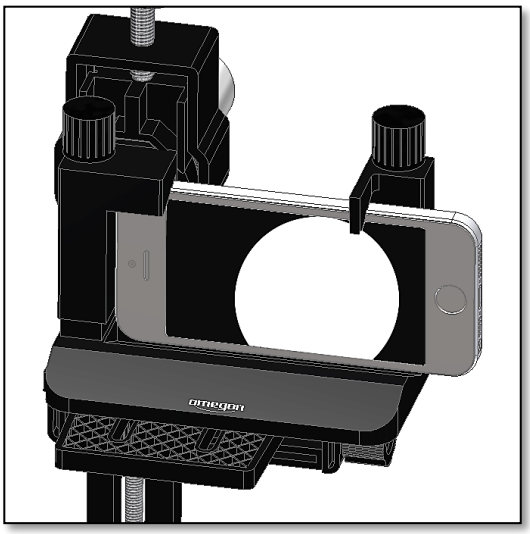

Figure 11. *The round lens circle as seen on the screen.*

3. Installing the eyepiece to the clamp. The long eye-relief eyepiece should not exceed 45mm on the outside diameter. Most 1.25" eyepieces are small enough to fit the clamp. Slide the eyepiece in the clamp so that the eye side lens points to the smartphone. The smartphone camera will "look" through the eyepiece to take photos. It is important that the eyepiece is as close to the camera lens as possible. Turn the clamp knob (A) so that the eyepiece is securely fixed and does not move or wobble – figure 9. Most eyepieces have a rubber eye guard that can be removed – figure 10. Usually this rubber eye guard is flexible so it will fold down when touching the smartphone's surface. If this rubber eye guard is however hard we suggest removing it and keeping it safely stored. By removing this rubber eye guard, the eyepiece will be free from any additional unnecessary spacing. This will keep the distance between the eyepiece lens and the smartphone camera at its minimum as desired. At this point it is now necessary to make small adjustments so that both the optical axes of the camera and the smartphone are perfectly aligned.

All the weight from the photographic setup will be hanging on the eyepiece! It is very important that the clamp pushes the eyepiece's body firmly to avoid it from slipping when in operation.

3.1. Fine tuning. Before starting to take photos with the smartphone, one last step is required. Turn on the smartphone's camera. A close-up and defocused image of the eyepiece lens will be visible. A circle or a part of a bright circle will be clear on the screen– figure 11. This white circle is the light coming from the eyepiece, as seen by the camera. The circle has now to be centred to the camera lens. Adjust the camera position using the height and sideways knobs as depicted in figure 7. Some few turns should be sufficient because the initial coarse centring was already done. Do not worry if you do not see a complete white circle centred to the camera screen. Some smartphones have the camera's optical axis off-set in relation to the screen centre - so even when adjusting the position of the camera a complete perfectly centred circle may not be possible to achieve. Try to centre the circle as best as you can. When you are done, fix the system in position using the fixing knob I – figure 7. **3.2. Connecting to the telescope.** Slide the eyepiece to the focuser and make sure to tighten the barrel firmly so that the system does not tip to any side – figure 12. Focus the eyepiece, as you would normally do when doing visual observation. The focused image will show on the smartphone's screen. If the edges of the illuminated circle are too dark, use the zoom function on the capture features – use just enough zoom so that the image is uniformly bright.

Figure 12. *Slide the eyepiece to the focuser as you would do for visual use. Make sure to tighten all eyepiece thumbscrews.*

3.3. Which astronomical objects can be photographed?

3.3.1. Deep-Sky objects. These objects are so dim that afocal photography is very difficult. Most smartphone cameras are not designed to capture night pictures, so they are also not good for faint deep sky objects. The captured images have too much electronic noise to be used. There are some apps that allow to add multiple images to increase the signal/noise ratio, giving a "pseudo" long-exposure result. Some smartphones are more sensitive than others. Give it a try!

3.3.2. The Sun. Is by far one of the most exciting objects to photograph. It has unique features on its surface that can be easily photographed. Make sure to always use a suitable solar filter when taking pictures of the Sun. Select *"Solar Rate"* when using a motorized mount to track the Sun. This way the telescope will follow the Sun's apparent movement on the day-sky.

Never photograph the sun without an adequate dedicated sun filter. A front aperture telescope filter must always be used. Even looking briefly through the telescope's eyepiece may cause permanent eye damage or even blindness.

3.3.3. Planets and the Moon. Mercury, Venus, Mars, Jupiter, Saturn and of course the Moon are targets that are easily photographed by using the afocal photography method. The Moon can be a very bright object - we recommend the use of a Moon filter for telescopes with more than 6" in aperture. Using colour filters for planet photography is also recommended, these allow to emphasize surface details. Just thread them to the eyepiece threaded barrel as you would do with a Moon filter. A barlow lens is also recommended. It allows to magnify the planet's disc and photograph it in more detail. Use a planetarium software to check the current planet position on the night sky making it easier to locate it on photograph.

4. Product Specifications.

Smartphone Bracket	
Size:	88mmx60mmx120mm
Weight:	150g
Maximum smartphone width:	80mm
Threaded holes:	¼"-20
Material:	ABS Plastic and Brass
Adapter body	
Size:	105x115x195mm
Weight:	350g
Eyepiece diameter:	from 28mm to 45mm
Platform maximum load:	1.5kg
Material:	Injected Aluminium, ABS Plastic and steel