

# Instruction Manual

omegon



**Omegon® 150/750 EQ-4**

English version 12.2014 Rev A

## The Omegon® 150/750 EQ-4

*Congratulations on the purchase of the new Omegon® 150/750 EQ-4. This advanced telescope will give you hours of fun, with its all optical glass lens and light gathering ability, it is the ideal companion for deep sky observation. With this telescope you will be able to see the craters on the Moon, star clusters, nebulae the Jupiter disc features and its Galilean moons and the rings of Saturn. We have included many accessories so it will be easy to use this telescope.*

### 1. Included parts

We have included several accessories that will make the use of the telescope easier and fun, please take a look at the list of the parts so you can identify them in the future.

#### 1. Barlow Lens 2x.

2, 3. Two eyepieces 1.25" (31.75mm); a Plössl 25mm, Plössl 6.5mm eyepiece;

4. Red-dot Finderscope;



Figure 1. Parts List

### 2. Getting Started

It is very simple to get started. Here is how the telescope works. The telescope main lens should point to the object being observed. The mirror on the back of the tube will gather the light coming from the object and reflects it to the secondary mirror that brings it to the eyepiece. The focuser tube moves up and down to get a precise focused image. At the focuser one can use the supplied accessories. Different accessory combinations give different results, such as different image magnifications or correct image. But all this will be explained in detail in the next pages.

### 3. Assembly

Start by setting the tripod. Open the tripod legs as shown (figure 2). Place the supplied accessory tray (figure 3). The accessory tray can be used to place the telescope accessories such as the eyepieces, filters etc. Next place the equatorial mount on top of the tripod (figure 4), the mount will bear all the weight of the telescope so it is important to thread it securely. Thread the counterweight shaft as shown (figure 5), it fits the threaded hole on the Right Ascension (R.A.) axis. Remove the foot-saver (the screw and washer – figure 6) from the shaft's end and slide in a Counterweight. Make sure to use the counterweight's locking knob so that it is securely fastened. You can leave it at half the shaft length for now.

**ATTENTION!** Never look at the Sun through a telescope. Concentrated Sun light may cause serious eye injury. Children should use only with adult supervision.



Figure 2. Set the tripod.

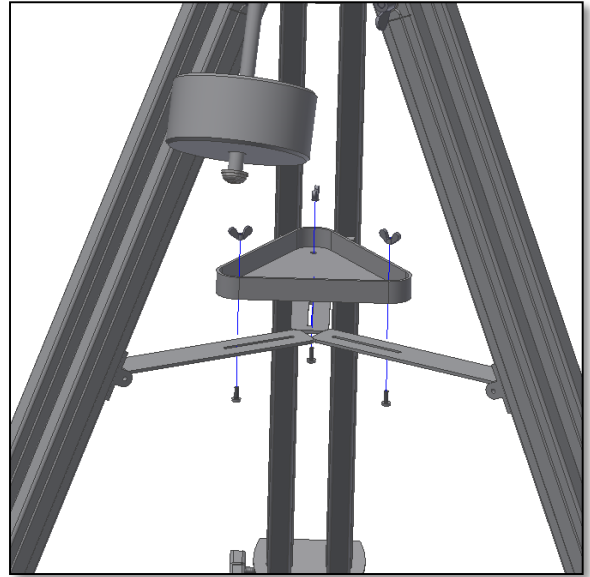


Figure 3. Tray placement.



Figure 4. Place the equatorial mount.



Figure 5. Thread the counterweight shaft.

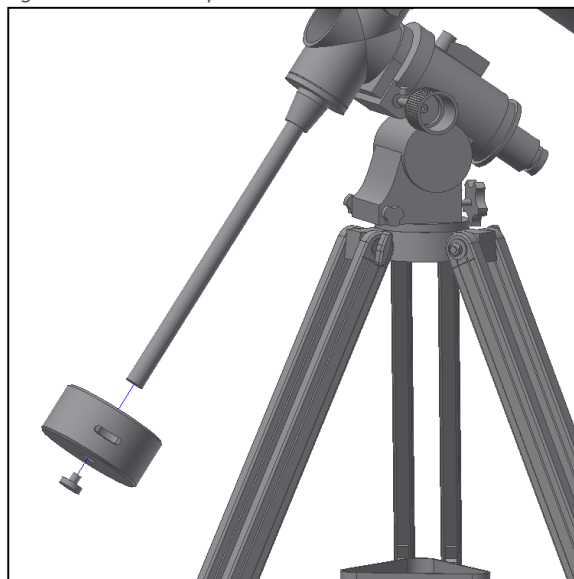


Figure 6. Slide counterweight and thread the foot-saver.

Place the tube rings (figure 7) on the mount platform and make sure both clamp knobs are facing the same side, they will be used to place and remove the optical tube when necessary. It is important that they are well tightened and don't rotate. Next, insert the fine adjustment knobs on each axis (figure 8). These knobs allow to make small movements on both axis of the telescope. Use the included thumbscrew on each. Make sure they fit the slotted surface on the protruding axis shaft. Open the tube rings that were previously fitted to the telescope and insert the tube (figure 9). Close the



Figure 7. Place the tube rings.

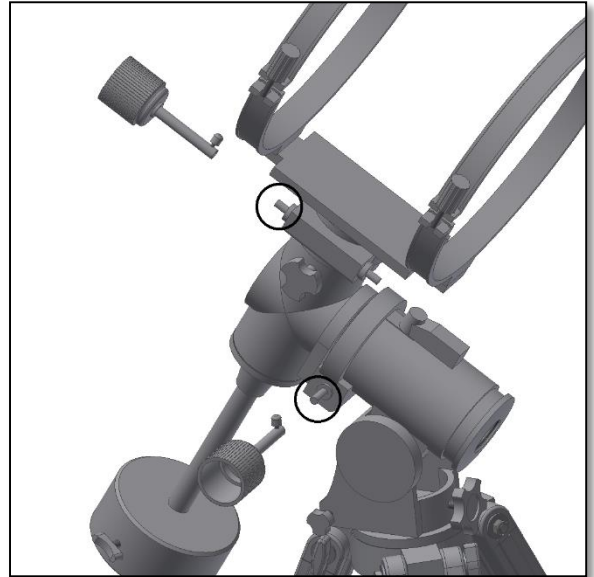


Figure 8. Place fine adjustment knobs.



Figure 9. Slide tube and thread the ring knobs.

rings and clamp the two knobs. Slide the tube so that the focuser is pointing up and is more or less centred. Depending on the telescope tube weight you might find useful to use two counterweights. The finderscope is placed next to the focuser, remove the two thumbscrews as shown in figure 11 and place the finderscope. Make sure the finderscope (figure 12) is pointing in the same direction as the telescope's aperture so when you point the telescope to an object you also point the finderscope to it.

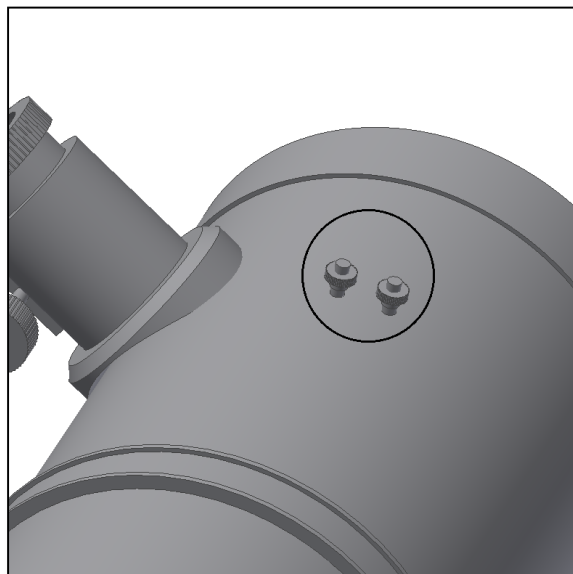


Figure 10. Finderscope thumbscrews.

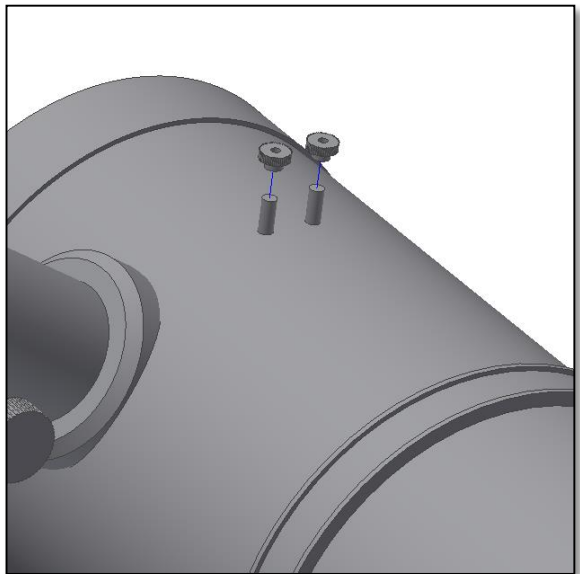


Figure 11. Remove the finderscope thumbscrews.

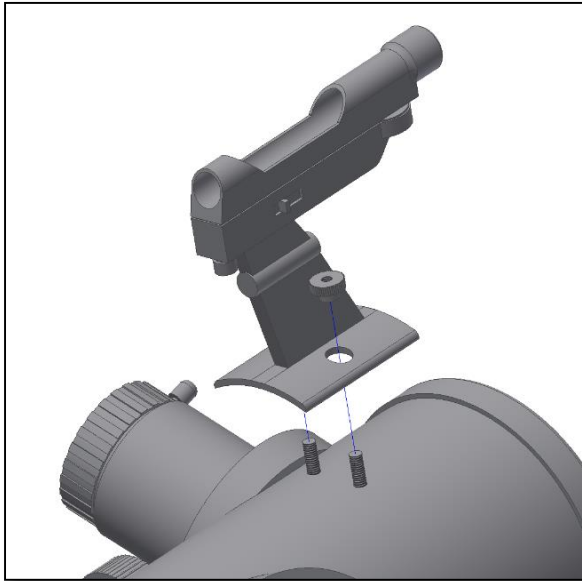


Figure 12. Place finderscope.



Figure 13. Locking handknobs.



Figure 14. Balance the telescope.

Note the two locking handknobs (figure 13). When released they work as clutches and allow free movement in both axis. When fully tightened you can use the fine adjustment knobs (figure 8). For easy operation the telescope still needs to be balanced. Adjust the counterweights (figure 14) so that when you release the locking handknobs the telescope moves freely. The telescope is balanced when neither the tube nor the shaft axis tilt to any side. To adjust the R.A. axis (arrow in figure 15) and rotate the altitude handknob (circle in figure 15). When ready lock again. To adjust the azimuth use the two side hand knobs as shown in figure 16.

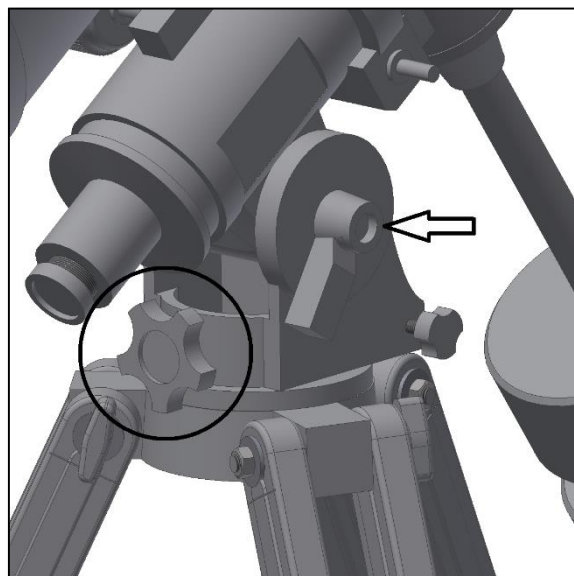


Figure 15. Adjust the altitude axis.

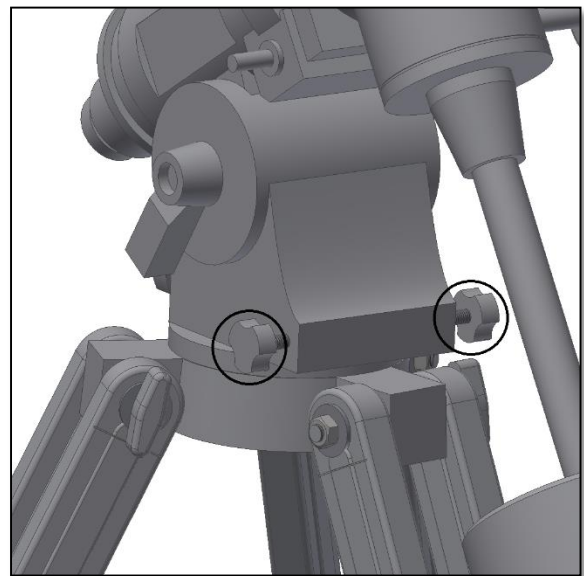


Figure 16. Adjust the azimuth axis.



Figure 17. Adjust the secondary mirror.

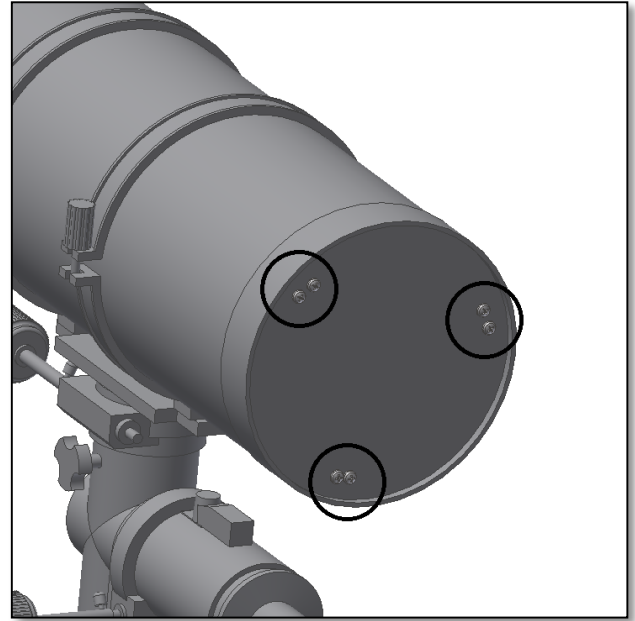


Figure 18. Adjust the primary mirror.

#### 4. Alignment of the optics and collimation.

Telescopes require periodical checking for the alignment of the optics. The optics should be aligned (or collimated) so that the telescope can achieve a good performance and deliver a sharp image. This is especially important for reflector telescopes (that use mirrors). First let's start by checking the collimation.

Look for a bright star in the evening sky and centre it in the eyepiece's field of view. Some power is required to check alignment, make sure the star is focused. Now use the focuser knobs and rotate so that the star comes out of focus (defocused). You will be able to see a defocused star. It will appear as a series of rings. These are called diffraction rings and they will be important to determine how good (or how bad the alignment is— figure 19).

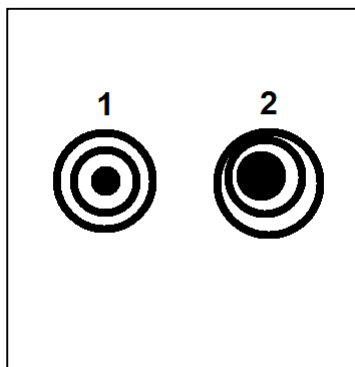


Figure 19. Diffraction Rings: 1. good alignment and 2. Poorly aligned

If the optics are well aligned you will be able to see a defocused star similar to a series of concentric rings (1 in figure 19), a poorly aligned telescopes will show a series of eccentric rings (2 in figure 19).

The telescope is equipped with a set of collimation screws for both the secondary mirror (figure 17) and for the primary mirror (figure 18). They can be used to adjust the tilt of both mirrors and to achieve alignment. This information is for your reference.

#### 4.1. Collimate the optics.

Remove the eyepiece from the telescope's focuser. If you look directly to the secondary mirror, you will see a reflection of your eye. The light is being reflected from the secondary mirror to the primary and back.

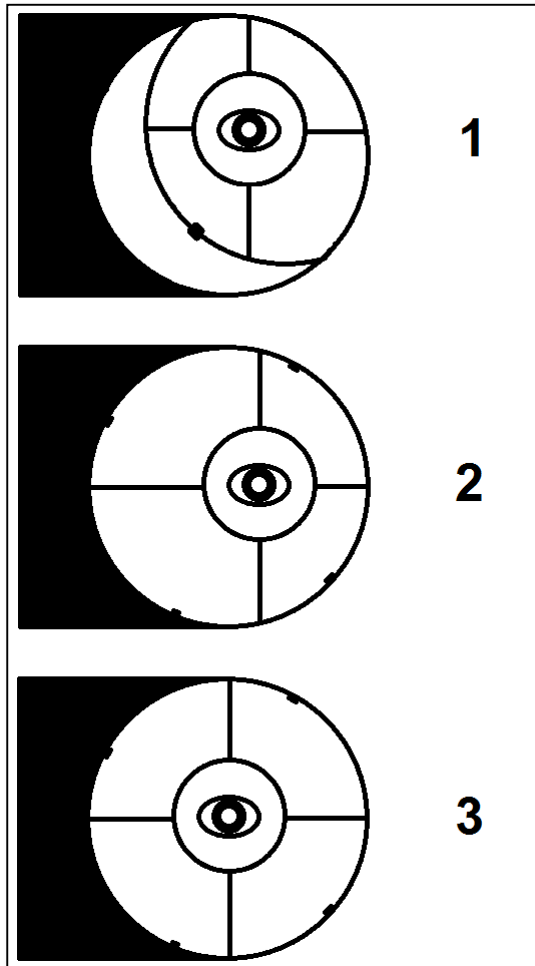


Figure 20. Different stages of collimation.

Figure 20 shows the different stages of collimation.

1- Telescope optics are completely out of collimation. Adjustment is necessary both in the secondary and in the primary mirror.

2- Secondary mirror is aligned but primary mirror needs adjustments.

3- Telescope's optics are aligned and star test should show concentric rings. The telescope will perform at its best.

#### 4.2. So how to get to good alignment?

4.2.1. Let's start with the secondary mirror. When peeking at the focuser without the eyepiece and looking at the secondary mirror one can see the reflected eye. One can also see the telescope secondary spider vanes (4 vanes cross shaped) and the primary mirror's holding pads (figure 21).

The secondary mirror can be adjusted by using the 3 screws (figure 17). Releasing it can make the secondary mirror support to rotate. So make sure you only adjust one screw at a time to avoid it. The secondary mirror should always

show up as a circle and not an ellipse. Please make sure this is the case.

As soon as you get the primary mirror and the primary mirror pads centred (figure 20 – 2) you are good to go to the next step.

4.2.2. The primary mirror needs to be adjusted. Adjusting the primary mirror will move the secondary mirror reflection to the center. Use the 6 screws on the back of the telescope. Notice that 3 screws are used to adjust the tilt of the primary mirror while the three others are used to hold the tilt position. Adjust the primary mirror so that you get all reflections centred (figure 19 – 3). Your telescope is now collimated. Check the diffraction rings (figure 19) and repeat it if necessary.

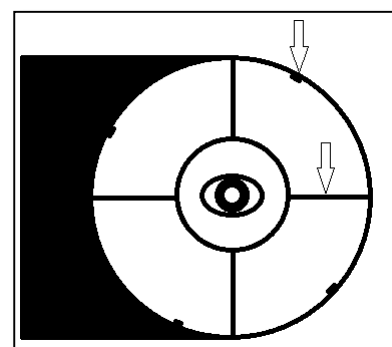


Figure 21. Vanes and primary pads.

**4. Start using your Omegon 150/750 EQ-4 telescope.** Point the telescope to a distant object during the day. It is important to do this during daylight so that you get familiarized with the telescope operation. A good target is a church tower, a chimney or a distant mountain peak. Rotate the focuser knob so that the focuser tube moves in and out. Do this slowly. We suggest that you start by racking the focuser all the way in and slowly move it out. With the PLössl 25mm eyepiece you should be able to get a focused image easily.

Make sure to use the locking hand knobs (figure 13) and use the fine adjustment knobs (figure 8) to point the telescope to an object.

**ATTENTION! Never use the altitude and azimuth knobs to point to the telescope. The altitude knob bears all telescope weight and continuous use can damage it permanently!**

**5. The finderscope.** Before we mentioned the finderscope as a valuable tool to point the telescope at an object. To operate properly, the telescope and the finderscope should be aligned. The image obtained through the finderscope has a much broader field of view than that of the telescope. Aligning means matching the telescope image to the image of the center of the finderscope. This way when looking through the finderscope one knows the telescope is pointing exactly to the same point, making looking at objects much more easier.

### **5.2. How to align the finderscope?**

You have the house chimney (example mentioned before) centered at the telescope eyepiece field of view. Now look through the finderscope. The small red dot (recticle) in the center of the finderscope field of view should match the center of the telescope field of view. Adjust the two finderscope thumbscrews to get the red point to the same object as the telescope (as shown in figure 5.2.2).

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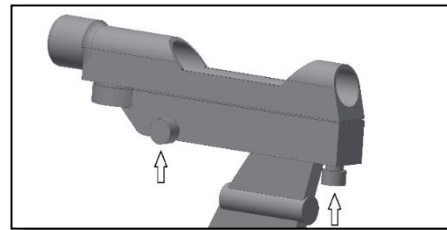
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**5.2.1.** A distant object is centered at the telescope's field of view. In this example we have a house with a chimney. The chimney is the reference point to place at the center of the field of view. We first look through the telescope with the lowest magnification possible (PLössl 25mm should be preferable), so we have the widest field of view.



**5.2.2.** Looking through the finderscope (it should be powered on) we see the same building, but in this case the chimney is not centered. We adjust the finderscope using the two thumbscrews so that the finderscope point moves slightly. This is enough to correct the object's position in the finderscope. Trial and error is required to get a satisfactory result.



**5.2.3.** After playing with the two finderscope thumbscrews and some trial and error, we get the finderscope recticle close to the center (in this case the chimney). The finderscope is now ready to use!



## 6. Using the accessories, a bit of math to understand how all it works.

Using the accessories is easy and fun. To change magnification simply swap eyepieces. To get more magnification simply use the barlow lens. But how does all of this work?

### 6.1. Power (magnification)

Your telescope has a focal length of 750mm. This is approximately the distance between the telescope lens and its focal point (very similar to the distance between the focus point of a loupe and the loupe lens). This is a very important feature that allows to determine several interesting facts such as magnification.

The magnification is determined by the telescopes focal length and the used eyepiece. You probably noticed that the three supplied eyepieces are Plössl 25mm and Plössl 6.5mm. This means that the Plössl 25mm is a 25mm focal length eyepiece, while the Plössl 6.5m is a 6.5mm focal length eyepiece.

To determine the magnification just divide the telescope's focal length by the eyepiece's focal length. Lets give an example for our telescope and the supplied eyepieces:

The Telescope focal length is 750mm  
Plössl 25 eyepiece focal length is 25 mm

$$\frac{750mm}{25mm} = 30 \text{ power}$$

### Some possible accessory combinations

	Terrestrial View	Moon	Deep Sky	Jupiter and Saturn
Barlow Lens 2x		Yes		
PL6.5mm Eyepiece				Yes
PL25mm Eyepiece		Yes	Yes	
Power	<i>Not suitable</i>	60x	30x	115x

This means that the Plössl 25mm eyepiece provides a 30x power (magnification). This seems low, but try it, you will see a bright image with a lot of detail.

### 6.2. Barlow Lens

The Barlow lens is a very interesting device. It is a negative lens that multiplies the telescope's focal length. So a 2x Barlow multiplies the original focal length by 2x, in this case  $750mm \times 2 = 1500mm$ .

A 3x Barlow lens multiplies it by 3x. Your telescope is supplied with a 2x Barlow lens. When used with the Plössl 25mm eyepiece you get 2x the power obtained before  
 $30 \text{ power} \times 2x \text{ Barlow} = 60 \text{ power}$

### 6.3. Erecting lens (not included)

The erecting lens gets you an upright image view with the telescope. It also adds some power like the barlow lens.

### 6.4. Diagonal Mirror (does not apply to this telescope model)

This diverts the light coming from the telescope to an angle of 45 or 90 degrees. It is useful, because it provides a more comfortable position when observing.

Here are some examples on how to use the accessories.

## 6. What can be seen with this telescope?

Below you will find some examples of what you can expect to see when using this telescope.



**6.1.** The Moon is one of the most spectacular objects to be seen through a telescope. Even a small telescope will reveal high detail of the Moon's surface. You will be able to see the craters on the Moon's surface and other features like the Mare. The moon is a very bright object. It is better observed when the Moon is not full. Try the crescent Moon and look for features along the terminator (between illuminated and dark surfaces).



**6.2.** Jupiter is the biggest planet of our solar system. It is also one of the favorite targets for beginners. Galileo was able to discover that the four tiny dots that turn around the planet were in fact part of Jupiter's system of moons. With this telescope you will be able to see not only Jupiter's planet disc with its two major discernible bands, but also its biggest moons, Io, Europa, Ganymedes and Callisto.



**6.3.** The "lord of the rings" of the night skies, Saturn is by far the most popular target for small telescopes. Saturn's rings are discernible even at 60x magnification. In a very good night you will be able to see the Cassini's division (the darker band on the Saturn's rings).

## 7. Troubleshooting and frequently asked questions

**Q: I get a mirrored view of the objects. Like if they were reversed, and R show's up like Я**

R: Mirror telescope reverse objectes, this is give a mirrored image of the object. To get a corrected image it is necessary to an image corrector. Note that reflector telescopes are not intended to be use for terrestrial observation.

**Q: I use the finderscope to point to objects but I always miss the target.**

A: You probably need to realign the finderscope. Please proceed as described in 4.2.

**Q: When I use the barlow lens and the Plössl 6.5mm eyepiece the image is so dark I can't hardly see anything.**

A: Power should be used with moderation. It depends on how stable the atmosphere is, too much turbulence causes image distortion. Usually the limit is 2x for each millimeter of the telescope aperture. In this case, the telescope has an aperture of 150mm, so in a very good night you should be able to reach 300x. The more magnified the image is, the darker it gets.

**Q: Is my telescope compatible with other eyepieces ?**

A: Omegon telescopes are compatible with all telescope eyepieces from different manufacturers as long as the eyepiece is a 1.25" (or 31.75mm) size eyepiece. If you would like to test an eyepiece from a fellow astronomer go ahead. Different eyepieces provide different visual experiences.

**Q: I want to use my telescope to take pictures.**

A: This telescope is designed for visual use. It doesn't mean it can't be used for photography, however it will be hard to get high quality pictures with this telescope. If you have a smartphone you can shoot the Moon or some terrestrial objects. Search online for digiscoping and afocal photography.

**Q: The stars only appear as points in the telescope.**

A: Stars will always appear only as points, even in the largest telescopes in the world. It is more interesting for beginners to observe two-dimensional objects, such the moon or planets. Once you find these, you will be able to start learning about the astronomical calendar.

**Q: I would like to observe the Sun.**

A: An appropriate solar filter, placed over the objective, is essential for observing the sun. These are available as plastic foil or glass filters. They allow only a tiny and harmless fraction of sunlight into the telescope, when securely positioned over the objective, so allowing you to observe the sun in complete safety. Eyepiece solar filters (not available from us) should be avoided at all costs as they are considered unsafe.

**Note: Never look directly at the sun through a telescope without an objective solar filter!**

**Q: I can't see anything when I look through my telescope**

A: The telescope is only suitable for astronomical observing and when used outside at night. Observing from inside the house or during the day is usually not possible. The dust caps must first be removed and an eyepiece inserted before you can start observing. Are you sure you have removed all the dust caps, not just the small ones? If you have not, then no light will enter the telescope and everything will appear black.