# Fluorite Ortho Apochromat

# *FOA-60*

## Instruction Manual

TAKAHASHI

Thank you very much for your purchase of the TAKAHASHI FOA-60 Fluorite Ortho Apochromat. This telescope is a doublet apochromat with ideally positioned lenses: one fluorite lens, and another new lens used by Takahashi for the very first time in this telescope. This combination has achieved a delicate correction of the spherical aberration, and can produce images with almost no color aberration.

In addition, this telescope offers a wide variety of observing applications with the flatteners and extenders optionally available from Takahashi. In order to use your telescope to its highest possible capabilities, please read this instruction manual very carefully and familiarize yourself with all of the functions that your telescope offers.

All telescopes have been strictly inspected before shipment. If there is anything wrong with your telescope when unpacked, please contact your authorized Takahashi distributor for proper care.

# Warning & Caution

## ⚠ WARNING

**WHEN THE TELESCOPE IS DIRECTED TO THE SUN, ITS LIGHT AND HEAT ARE BOTH INTENSE AND DANGEROUS. NEVER TRY TO VIEW THE SUN. DOING SO WITHOUT PROPER EQUIPMENT MAY CAUSE PERMANENT BLINDNESS.**




## ⚠ CAUTION

- When attaching the telescope on the mount, take care not to drop it or to be pinched, causing unexpected injuries.
- Never place the telescope on uneven place to prevent it from falling or dropping, which might cause injuries.
- Do not place the telescope in direct sun light. The light concentrated at the focal point is so intense that it might cause a fire.
- When focusing the telescope, be careful not to pinch your finger.
- Be careful that children do not swallow small parts such as button battery, eyepiece, etc.
- Flammable materials such as Styrofoam are used for packing material. Do not place it near a fire. Keep children away from the large vinyl bag to avoid risk of suffocation.

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# Specifications

Configuration ---------- Fluorite Ortho Apochromat Doublet

Effective Aperture ---------- 60mm all surfaces hard-multi-coated

Effective Focal Length ---------- 530mm

Effective Focal Ratio ---------- 1:8.8

Resolving Power ---------- 1.93”

Limiting Magnitude ---------- 10.7

Light Gathering Power ---------- 73X

With Flattener 0.93×

Effective Focal Length ---------- 495mm

Effective Focal Ratio ---------- 1:8.2

Image Circle ---------- ϕ44mm

With Extender 1.7XR

Effective Focal Length ---------- 900mm

Effective Focal Ratio ---------- 1:15.0

Image Circle ---------- ϕ44mm (100% illuminated)
ϕ88mm (reference)

Diameter of Main Tube ---------- 68mm

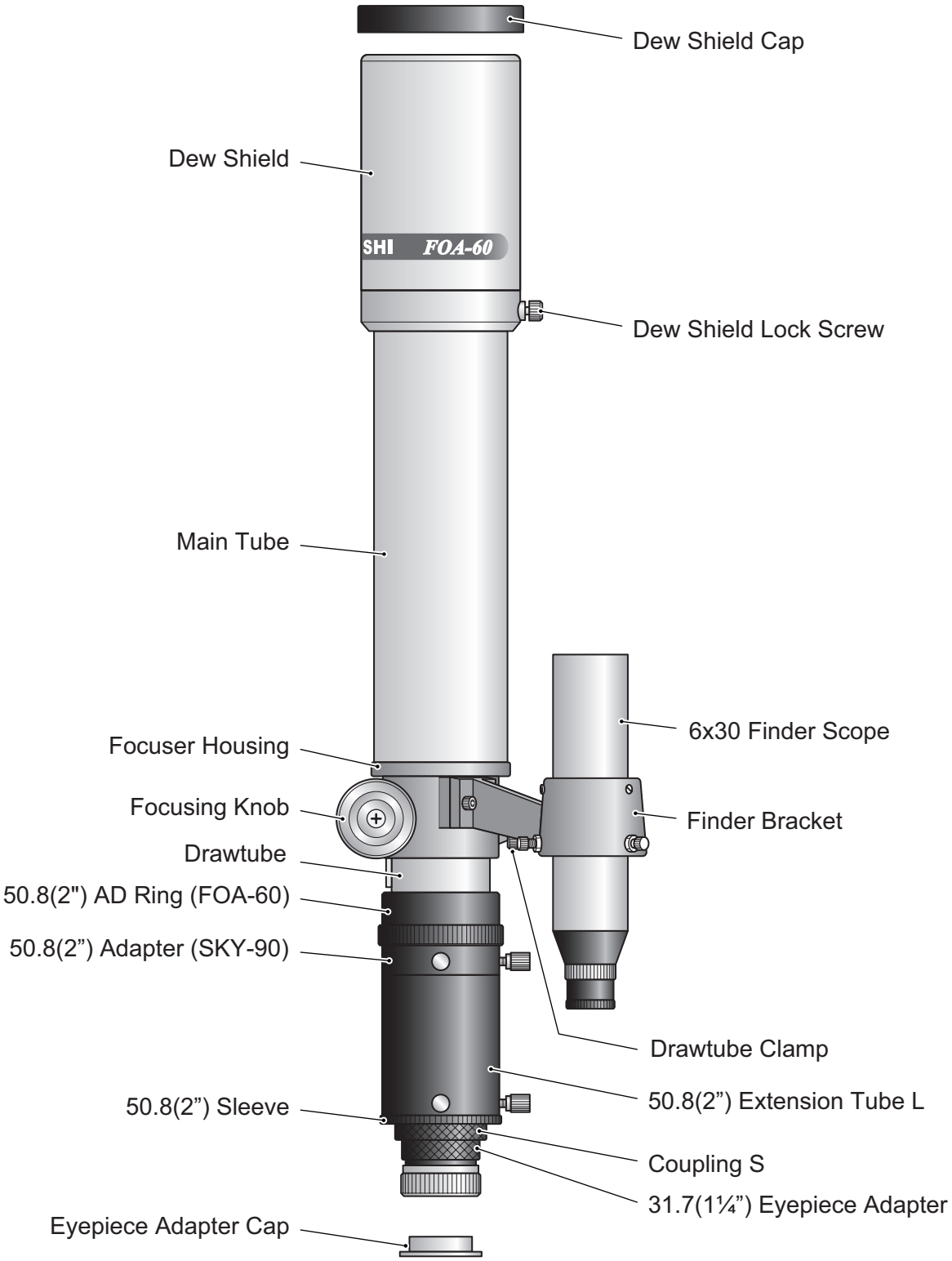
Total Length of Tube Assembly ---- 570mm

Weight of Main Tube Assembly ---- 1.8kg (about 3.6lbs)

Finder Scope ---------- 6x30 (optional)

Accessories ---------- Warranty card, Instruction Manual,
Hex wrench (4mm)

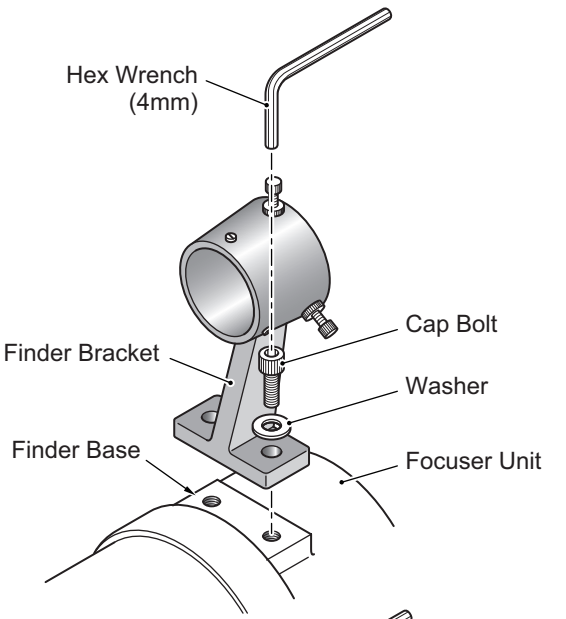
# Tube Assembly Layout

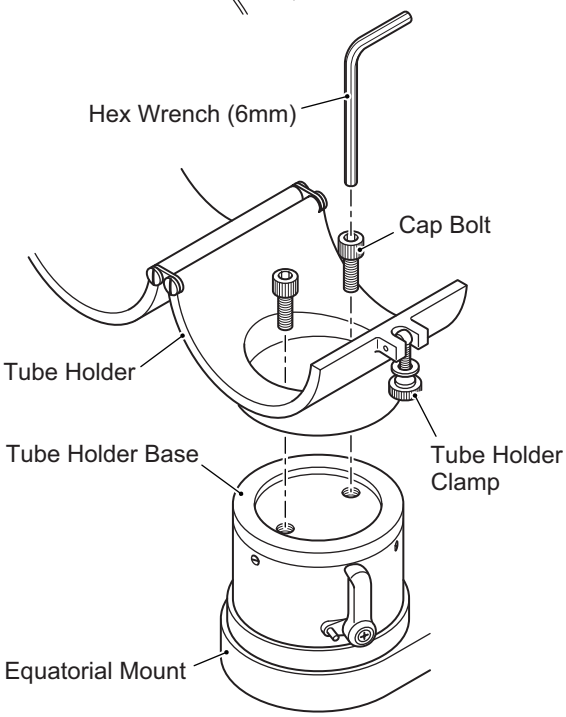


# Set Up Procedures

### ◆ Attaching the Finder Bracket

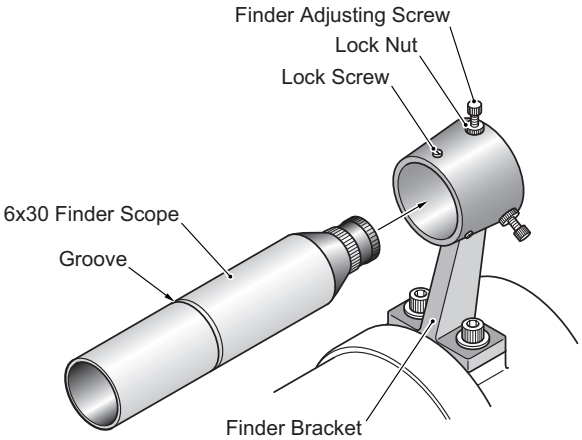
Place the finder bracket leg on the finder base on the main tube and lock it firmly with two cap-bolts, using 4mm hex wrench provided. Set the finder scope so that it is as parallel to the main tube as possible. Failure to do so can make alignment difficult.




### ◆ Attaching the Finder Scope

As illustrated at the bottom, insert the finder into the bracket so that the finder lock screw presses into the finder scope at the groove. Set the finder scope in the center of the bracket and lock it with the adjusting screws and lock screws. Attach the finder to a position as parallel to the main tube as possible.




### ◆ Setting the Telescope on the Mount

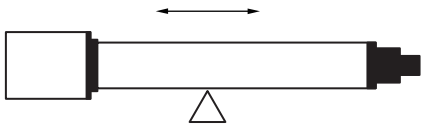
Set the tube holder on the tube holder base with two cap-bolts, and then place the tube assembly on the tube holder and lock the tube holder with the clamp after balancing the tube assembly. The tube holder can be used with all Takahashi mounts. If using this equipment for astro-imaging, the heavier duty the mount, the better.

## ◆ Balancing

Now that the telescope has been attached to the mount, it is necessary to balance the load in the R.A. and the Dec. When unbalanced, the clamps and the gearing of the motor drive do not work properly.

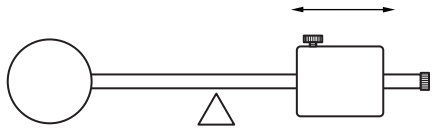
### ▼Balancing the Dec.

1. Unclamp the R.A. and lock it when the Dec. axis becomes horizontal. If the R.A. is greatly out of balance and does not rotate smoothly, first do a rough balance of the R.A.
2. Be careful that the package does not move abruptly. Hold onto the telescope, and loosen the Dec. clamp to adjust balance.
3. If it does not, loosen the tube holder and move the tube assembly forward and backward until it balances. Then, lock the tube holder. Especially when imaging package is attached, set the tube assembly at proper position.



### ▼Balancing in the R.A.

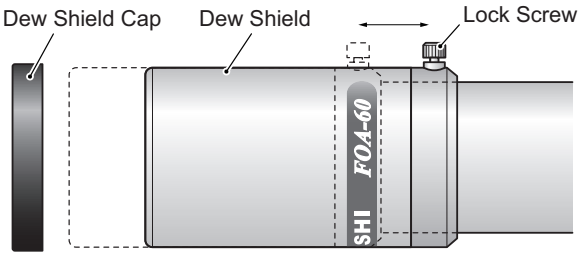
1. When the Dec. axis is balanced, lock it firmly with the Dec. clamp.
2. Loosen the R.A. clamp and check balance of the R.A.
3. If unbalanced, move the counter-weight(s) until the R.A. is balanced and lock it.
4. If still unbalanced with the weight fully extended, add extra weight.



## ◆ Retractable Dew Shield

The dew shield of the FOA-60 is retractable. To transport, it can be retracted and when observing, it can be extended to stop stray light coming into the tube. To extend the dew shield, follow the instructions below:

1. Remove the dew shield cap.
2. Loosen the lock screw.
3. Draw out the dew shield.
4. Tighten the lock screw.

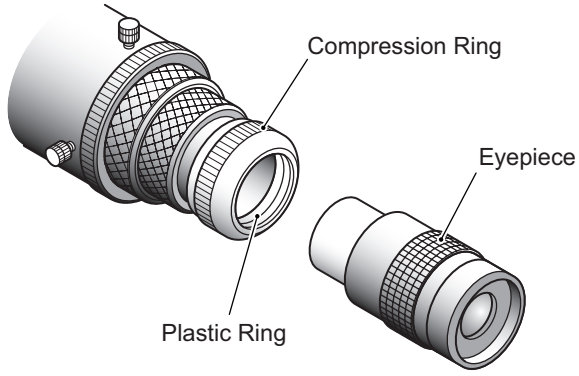



***(Note)***

When you retract the dew shield, be sure to remove the dew shield cap first. Otherwise, the cap may be forced off.

### ◆ Attaching an Eyepiece

Remove the eyepiece adapter cap and loosen the compression ring by turning it counter-clockwise. Then, insert a desired eyepiece or 31.7mm(1¼") diagonal prism into the adapter, and tighten the compression ring by turning it clockwise.




### ◆ Takahashi Eyepiece

A wide variation of eyepieces are available from Takahashi.

**▼LE Series**

Standard type, wide view field and high magnification range available in:

- 31.7mm (1¼") barrel
  LE5mm - 30mm
- 50.8mm (2") barrel
  LE40mm & 50mm

**▼TAK-UW Series**

Ultra-wide angle with apparent field of 90 degrees designed to get sharpest star images with a flat field telescope, available in:

- 31.7mm (1¼") barrel

TAK-3.3UW - 10UW

**▼Abbe Series**

Simple 2-group 4-element eyepiece with high contrast, less expensive with high performance, available in:

- 31.7mm (1¼") barrel
  Abbe 4mm - 32mm

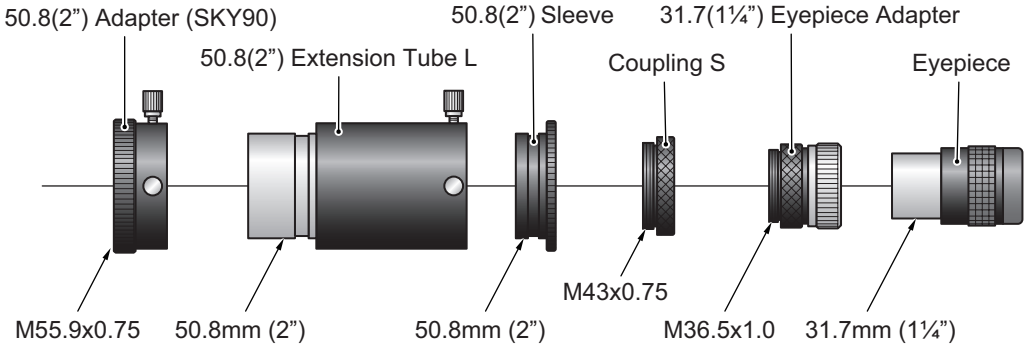
**▼Erfle**

With 3-group 5-element optics, 60 degree apparent field of view, almost no flare and ghost, available in:

- 31.7mm (1¼") barrel
  Er-28mm

### ◆ Attaching Accessories

Adapters and rings are attached on the visual back to attach various accessories. Please check the system charts and attach the desired accessories correctly. Standard connection is as follows.

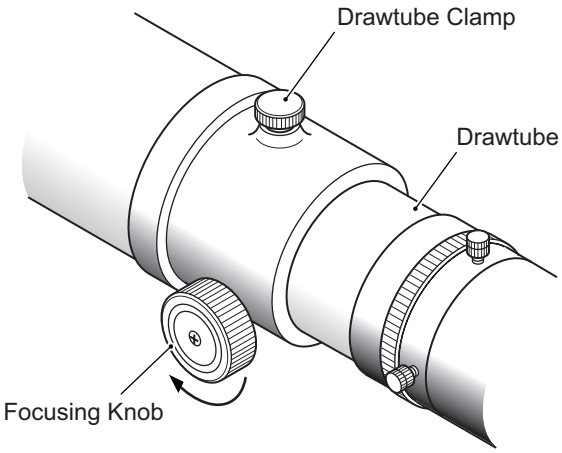


# Focusing

After inserting an eyepiece into the telescope, it is necessary to achieve the best possible focus. Remember that the atmosphere will limit the highest magnification that can be used on any given night. Using the lowest power eyepiece, focus the image and increase the magnification by using shorter and shorter focal length eyepieces until the desired magnification is reached. This procedure allows the centering of an object at high magnification. Please familiarize yourself with the following items so that you can always get the best focus in your observation.

### ◆ Focusing System

The FOA-60 uses a rack-and-pinion focuser. This focuser enables the observer to focus rapidly. Turning the focusing knob clockwise will move the drawtube out, while turning it counter-clockwise will move the drawtube in.




Drawtube will be moved out by turning the knob this direction.

### ◆ Focusing Process

Remove the dew shield cap and the eyepiece adapter cap. Insert the diagonal prism into the compression ring adapter. Carefully tighten the compression ring until it begins to make contact with the barrel of the diagonal prism. It is not necessary to overtighten the ring to hold the diagonal prism.Then insert the eyepiece into the compression ring of the diagonal prism, repeating previous process. Be careful not to overtighten the compression ring.

Begin the focusing process by choosing a bright star in a convenient position of the sky. When you think that you have achieved the best focus, move the focuser inside and outside of what you think is the best focus. This will confirm the critical procedure.
Begin with a low power eyepiece and then proceed higher and higher until the desired magnification has been achieved.

When the best focus at high magnification has been achieved, the observer may notice a bright and dim ring around the star. This is not a defect but rather a diffraction pattern which is an indication of the diffraction limited optics.

### ◆ Drawtube Clamp

The drawtube clamp is provided to lock the drawtube when the best focus is achieved. In visual observation, clamping the drawtube is not necessary, but in astro-imaging, the drawtube will move when a heavy package is attached so it is necessary to firmly clamp the focuser to keep the package from moving and spoiling the image. Don't forget to loosen the clamp when finished to help prevent damage to the gears.

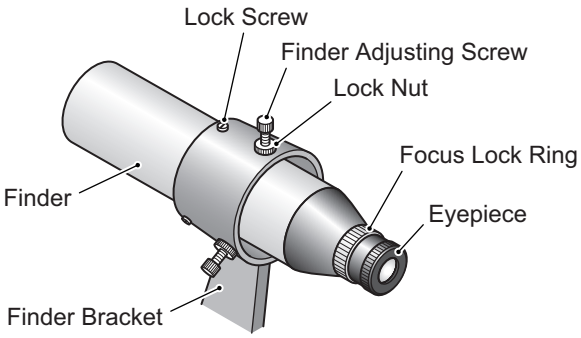
# Finder Adjustment

In the view field of a telescope, the image is seen highly magnified so it is so difficult to get a desired object in the field of view. Also when photographing an object with a camera, the image of the object on the focal plane is so dark it makes it difficult to center in the field of view. A finder is a useful tool. It permits the precise centering of an object in the field of view. The wide field of the finder can find an object easier in the view field. Therefore, it is important that the finder and the telescope be in alignment.

### ◆ Focusing

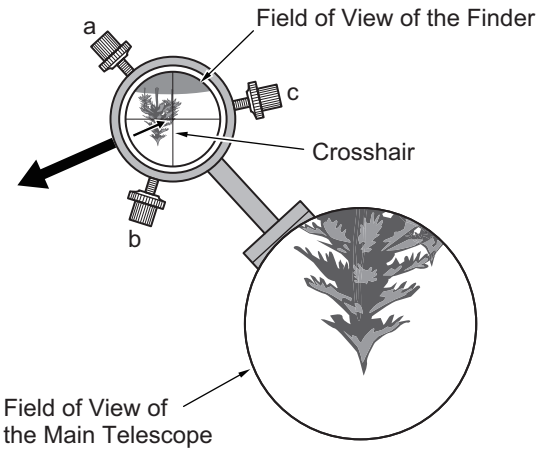
When you see some objects far away, if the finder is not focused, adjust the finder as follows.

1. Loosen the lock ring.
2. Viewing some objects far away, hold the eyepiece and focus the finder by turning the eyepiece clockwise and counter-clockwise.
3. When focused, tighten the lock ring.




### ◆ Finder Alignment Procedures

1. Set up the telescope for visual use according to the system chart and attach a low power eyepiece. Then, select a clearly noticeable object far away and center it in the view field.
2. Then, change the eyepiece to a high power one and again center the object in the view field. Then, lock the telescope.
3. Looking through the finder, move the finder with the following method and adjust it so the object is centered at the crosshair.
4. Turn all the lock nuts until they reach the head of the adjusting screw.
5. In order to move the crosshair in the direction of the arrow, first loosen the screw (a) and tighten (push) the finder with the screw (c). Next loosen the screw (b) and tighten (push) the finder with the screw (c). This procedure will move the crosshair in the desired direction. The top of the finder will move in the opposite direction and the object will move in the direction of the smaller arrow.
6. Turn all the lock nuts until they reach the finder bracket and lock the adjusting screw.



# Observation

### ◆ Preparation for Observing

The telescope will take time to temperature equalize in the cold weather, taking the telescope from a warm place to the outside. It is best to take out the telescope about one hour before observing begins to equalize with the colder air.

### ◆ Visual Applications

#### ▼Determining Magnification

The magnification of any eyepiece used with the telescope can be calculated by using the following formula.

(focal length of a telescope) divided by
(focal length of an eyepiece)

For example with LE-5mm
530mm / 5mm = 106X

Therefore, the shorter focal length eyepiece will produce the higher magnification. In general, the limit of the magnification will be 20X and lowest 1.4X, respective to the effective aperture (cm). In the case of FOA-60, the highest will be 120X and the lowest 8.4X. Therefore, most Takahashi eyepieces can be used with FOA-60.

#### ▼Diagonal Mirror & Diagonal Prism

When observing the zenith is necessary, it is advisable to use a high quality 90-degree prism. The Takahashi 90-Degree Prism is a quality multi-coated prism, which allows the observer to easily view the zenith by looking down into the prism. The diagonal prism has a 45-degree light pass and produces an erect, reversed (mirror) image. The diagonal prism is designed to be used with 31.7mm (1¼") barrel eyepieces.

The light pass length through the prism becomes longer so the drawtube must be moved a longer distance. In order to achieve the best focus, please connect the system parts as instructed.

### ◆ Astro Imaging

#### ▼Prime Focus Imaging

This is the method to take images at the focal point, just like using a telescope as a telephoto lens. Since the focal length of a telescope is far longer than that of a telephoto lens, even a slight error in guiding will result in poor star images. Therefore, a steady mount should be used to keep images as sharp as possible. A DSLR camera or a CCD camera can be used for the prime focus imaging. In order to attach a DSLR camera, the CA-35 (50.8/2") and the T-Mount DX-WR are required, according to the camera model.

#### ▼Eyepiece Projection Imaging

When the FOA-60 is used to take images of lunar craters or planets, the TCA-4 eyepiece projection system can be used for taking magnified images. The magnification for each eyepiece can be increased or decreased by moving the sliding tube that is an integral part of the TCA-4. This device can be attached to a DSLR camera with the T-Mount DX-S, which is available for EOS or Nikon.

In imaging the lunar surface, it is well illuminated so you can enjoy various images with various magnifications. For planetary imaging, make the magnification as high as possible according to the seeing. When the seeing is not good, you cannot take good images either of the moon or of planets. Check the seeing condition before imaging.

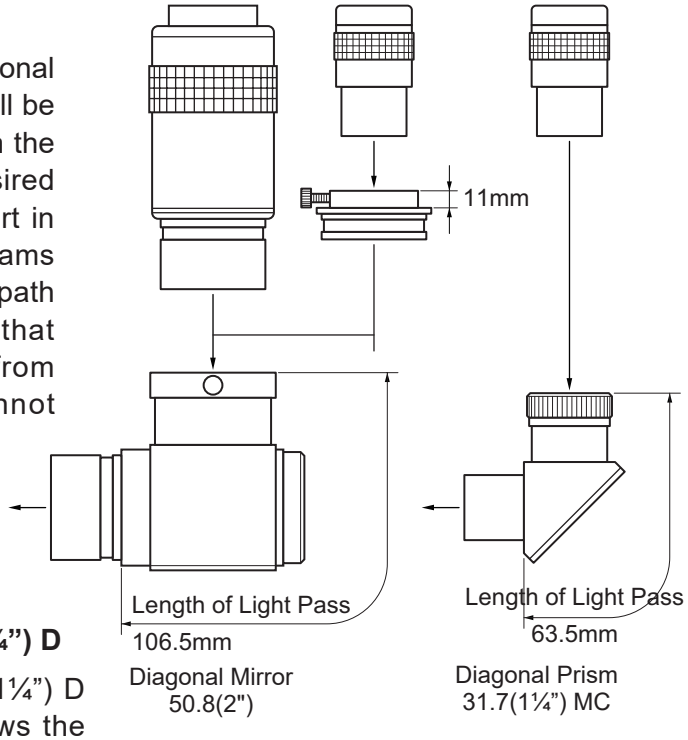
# Accessories

Takahashi offers a wide variation of system parts for the FOA-60, including:

◆ **Diagonal Mirror 50.8 (2")**

◆ **Diagonal Prism 31.7(1¼") MC**

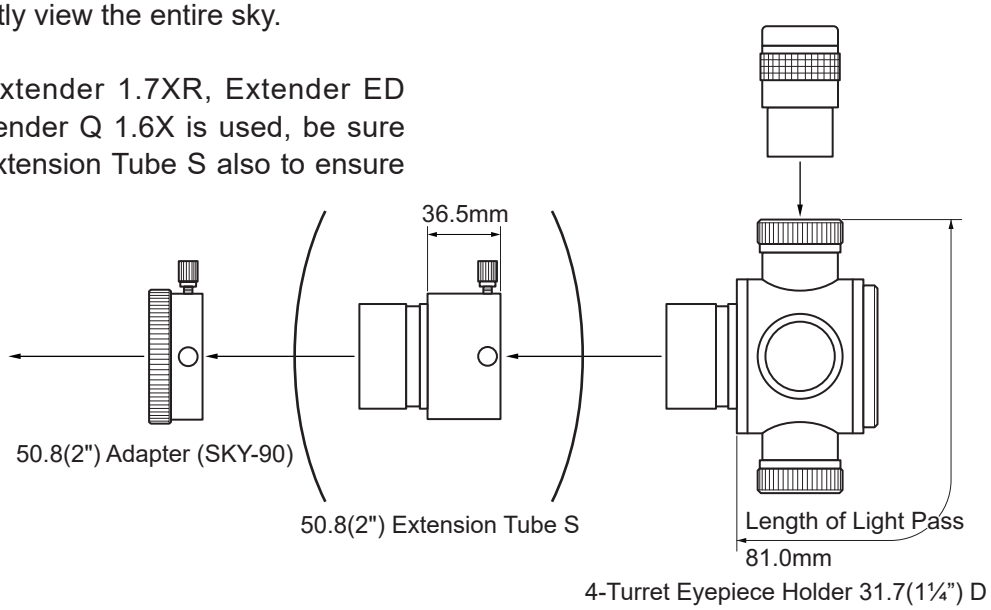
When the Diagonal Mirror or the Diagonal Prism is used, the light path length will be longer; so to get focus, you must turn the focusing knob more. Attach the desired accessories as instructed in the chart in order to get sharp focus. The diagrams shown at the right indicate the light path length for reference. Please note that some other 50.8 (2") eyepieces, from brands other than Takahashi, cannot focus.




◆ **4-Turret Eyepiece Holder 31.7(1¼") D**

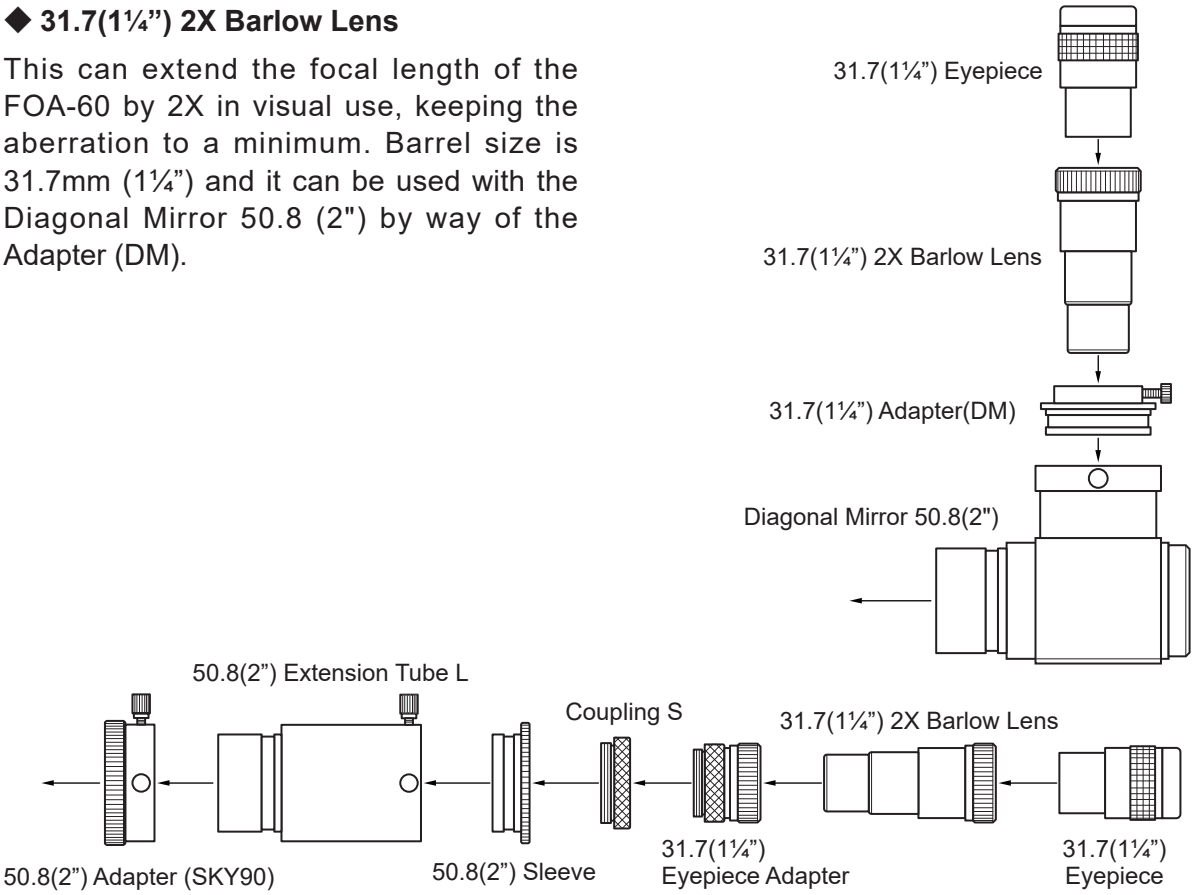
The 4-Turret Eyepiece Holder 31.7(1¼") D is a convenient accessory that allows the observer to use 4 eyepieces. This turret allows eyepieces to be changed quickly by turning it. In addition, this device has a built-in 90 degree prism that allows the observer to conveniently view the entire sky.

When the Extender 1.7XR, Extender ED 1.5X, or Extender Q 1.6X is used, be sure to use the Extension Tube S also to ensure sharp focus.



### ◆ 31.7(1¼") 2X Barlow Lens

This can extend the focal length of the FOA-60 by 2X in visual use, keeping the aberration to a minimum. Barrel size is 31.7mm (1¼") and it can be used with the Diagonal Mirror 50.8 (2") by way of the Adapter (DM).

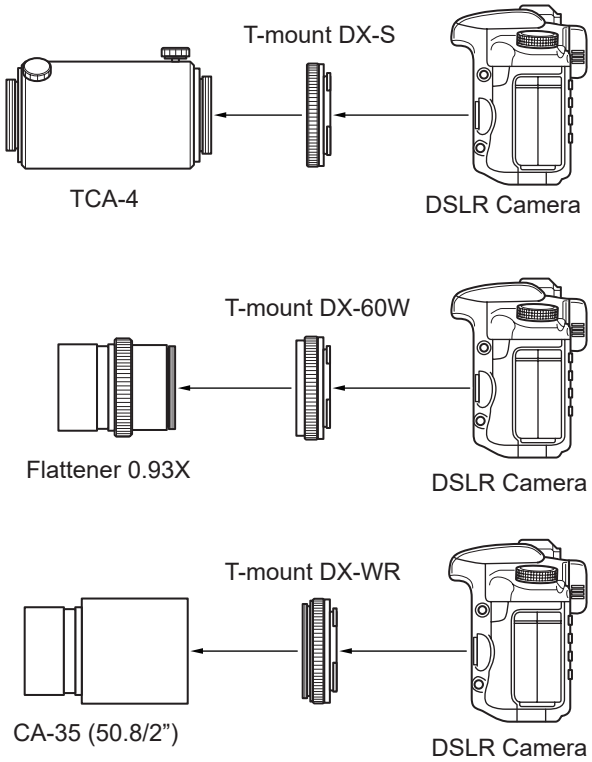



### ◆ T-Mount DX

In order to attach a DSLR camera and TCA-4 Projection Device, the T-Mount DX-S is used. For imaging with the Flattener 0.93X, the T-Mount DX-60W is required. For the other imaging at the prime focus or with the extenders, the T-Mount DX-WR is used. The T-Mount is available for EOS or Nikon.

**⚠ Caution**

Be careful of scratches and dirt on the T-Mount. These could cause misalignment of the camera, resulting in poor quality star images.



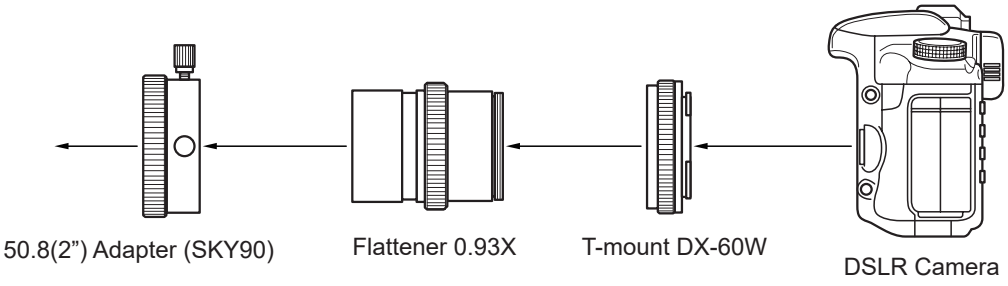
### ◆ Flattener 0.93X

The Flattener 0.93X with 2-group 2-element keeps the sharp image at the center of the field of the FOA-60 as it is. At the same time, it can correct the edge aberration at the prime focus and can shorten the focal length a bit to 495mm (f/8.2) as well. With use of the Flattener 0.93X, its F ratio becomes f/8, a bit slower, but it can produce images of 10 micron RMS-SPOT across the field. This is most well-suited for imaging deep sky and the outer corona in the total eclipse. Also, this is good for imaging birds and lands as a 500mm (f/8) super telephoto lens. The Flattener with 50.8 (2") sleeve can be attached and detached quickly to move from visual use to imaging mode.

**▼Imaging System with the Flattener 0.93X**

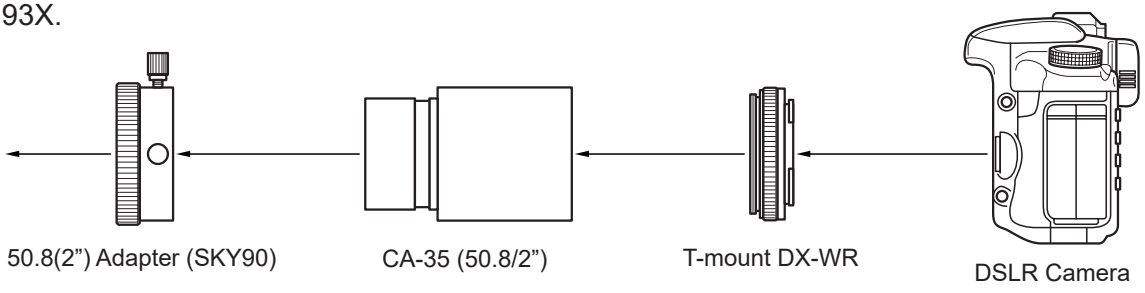
Effective Focal Length : 495mm
Effective Focal Ratio : f/8.2
Image Circle : ϕ44mm

**⚠Caution:**
Do not use the Flattener 0.93X and the Extender 1.7XR together. Use just one at a time.




### ◆ CA-35 (50.8/2")

For imaging at the prime focus, the CA-35 (50.8/2") is required to attach a DSLR camera. It can be attached with the 50.8 (2") Adapter (SKY-90) to connect a DSLR camera by way of the T-Mount DX-WR. If the flat field is required, use the Flattener 0.93X.



## ◆ Extender 1.7XR

The Extender 1.7XR with 2-group 4-element can be installed in between the main tube and the focuser unit, unlike conventional types. The Extender 1.7XR can extend the focal length and at the same time it can better correct the center aberration. In addition, it can correct the edge aberration, making the field practically flat.

This can extend the focal length of the FOA-60 to 900mm (f/15.0), offering highest optical performance of all Takahashi optical systems. Over the full range of the visible light transmission, it can produce images of 99% Strehl ratio across the field of a DSLR camera.

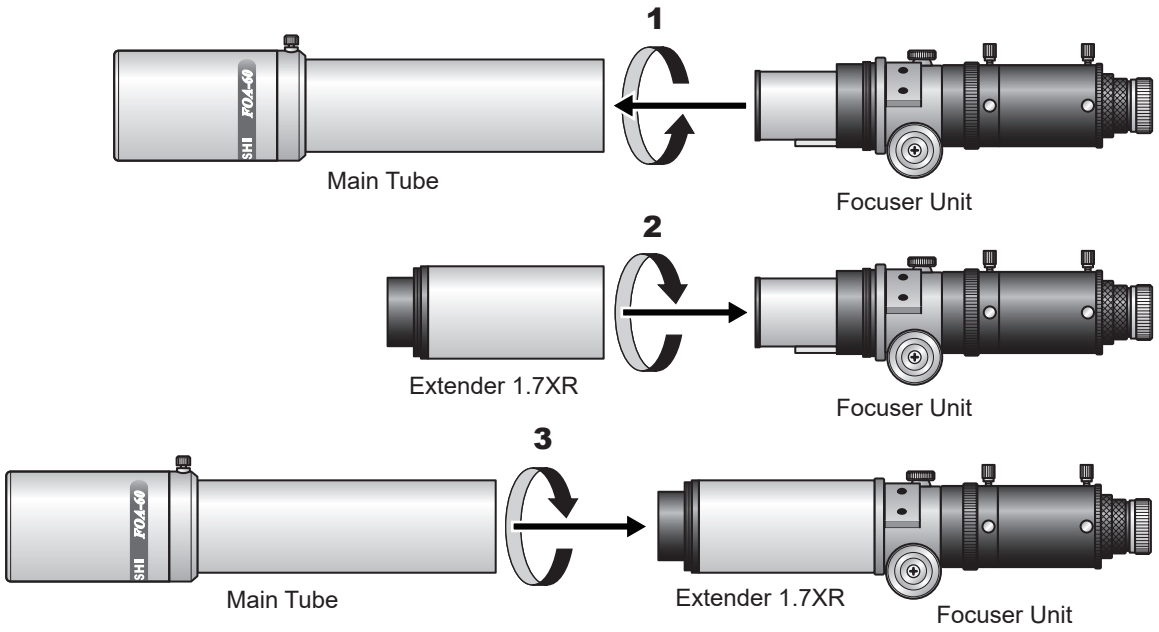
It is very compact, and with its long focal length and flat field it is well-suited to take magnified images of the corona or the prominence in the total eclipse. With almost no vignetting, it is also suited for imaging lands as a super telephoto lens.
For accessory connections, please refer to the system chart.

### ▼Imaging System with the Extender 1.7XR

Effective Focal Length : 900mm
Effective Focal Ratio : f/15.0
Image Circle : ϕ44mm (100% illuminated)
ϕ88mm (reference)

### ▼Attaching the Extender 1.7XR

1. At first, remove the main tube. Holding the focuser unit and the tube, turn them counter-clockwise to separate them.
2. Attach the Extender 1.7XR to the focuser unit by turning it clockwise until attached. Be careful not to attach it crooked or slanted to the focuser unit.
3. Then, attach the tube onto the Extender 1.7XR by turning it clockwise.



◆ **Extender ED 1.5X**
◆ **Extender Q 1.6X (50.8/2")**

The focal length of the FOA-60 is as short as 530mm. In order to get high magnifications, eyepieces with shorter focal lengths must be used. Generally, the eye-relief of the eyepiece with shorter focal length is short, so it is apt to make observers tired in a long observing session.

The Extender ED 1.5X can extend the focal length of the FOA-60 by 1.5X to 795mm (f/13.3) and the Extender Q 1.6X(50.8/2") can do so by 1.6X to 850mm (f/14.2) respectively. So, by using these extenders, optionally available, you can comfortably do the highly magnified lunar and planetary observations using eyepieces with long focal lengths.
These extenders can be easily attached with the 50.8 (2") sleeve system.

The T-Mount DX-WR is required to attach a DSLR. Use the T-Mount optionally available, according to the camera model.
If a flat field is required, the Extender 1.7XR is recommended.

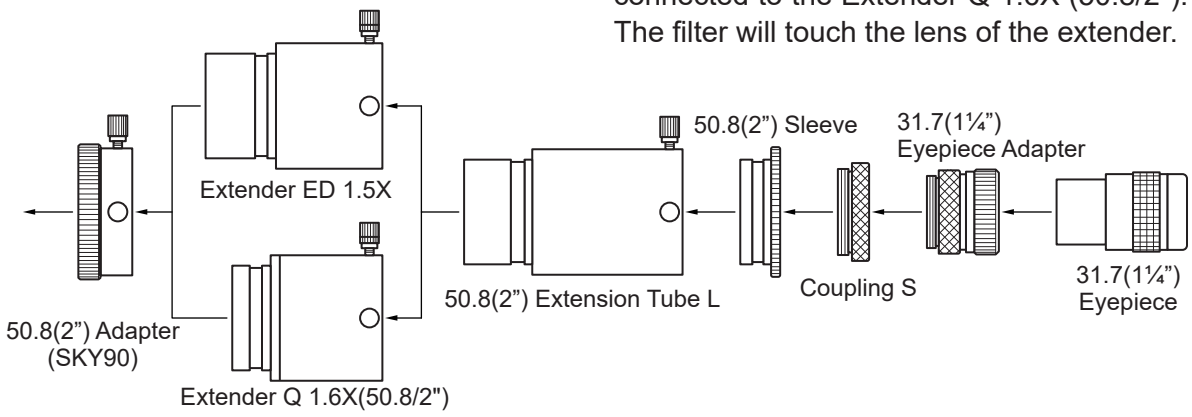
**▼Imaging System with the Extender-ED 1.5X**

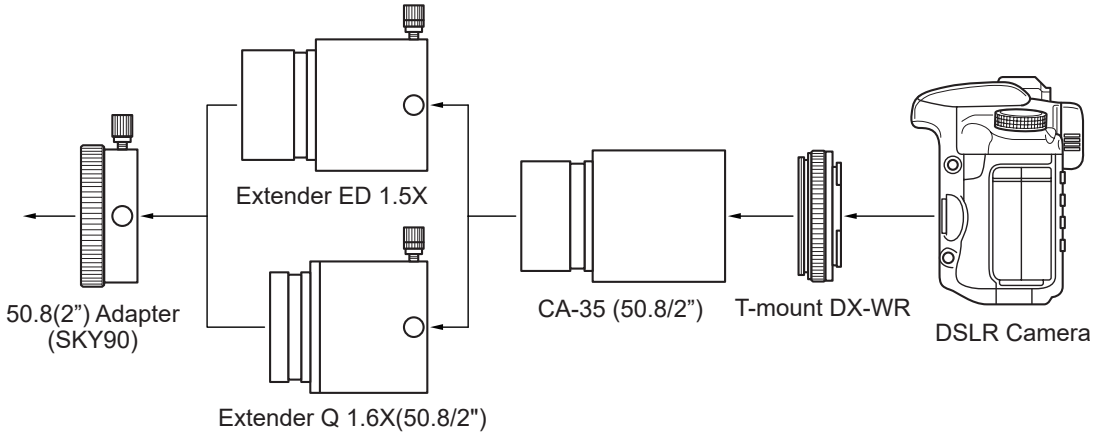
Effective Focal Length : 795mm
Effective Focal Ratio : f/13.3

**▼Imaging System with the Extender Q 1.6X (50.8/2")**

Effective Focal Length : 850mm
Effective Focal Ratio : f/14.2

**⚠Caution:**
Do not attach a filter when the 50.8(2") Extension Tube or the CA-35 (50.8/2") is connected to the Extender Q 1.6X (50.8/2"). The filter will touch the lens of the extender.



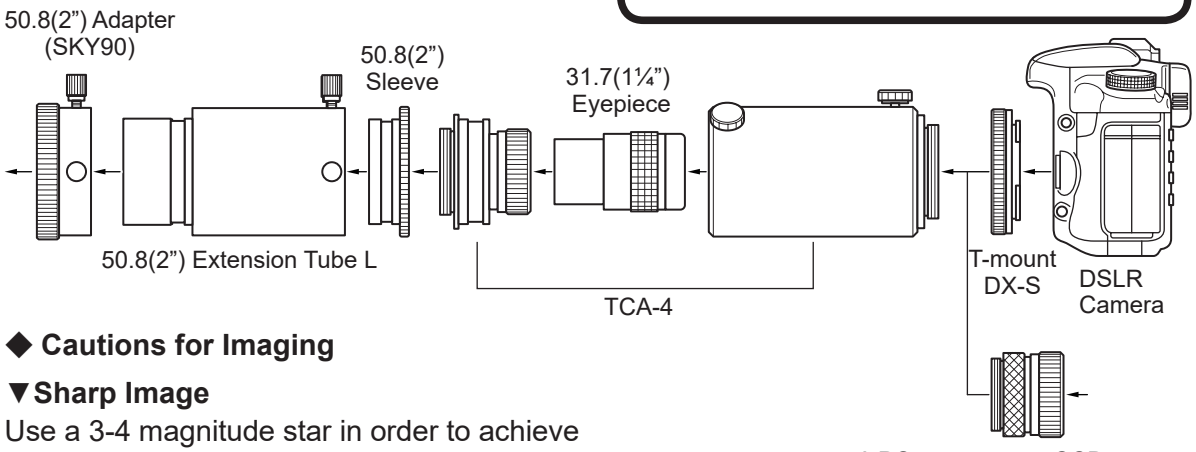
### ◆ TCA-4 Eyepiece Projection Device

This device allows the observer to change observing mode simply and quickly from visual to magnified mode.

You can easily change the eyepiece for magnified imaging, and can also simply adjust the magnifying rate, as you like, by sliding the magnifying tube. You can use any standard 31.7 (1¼") eyepieces with this device. To attach TCA-4 to a DSLR camera, the T-Mount DX-S is used according to the camera model.

**⚠ Caution**

When magnified imaging, the tube assembly will be apt to be out of balance. So, rebalance it according to the instruction of the Takahashi mounts. If the Dec. clamps are loosened carelessly, the tube assembly may turn abruptly and dangerously. When the clamp must be loosened, do so slowly and carefully, holding the imaging package with one hand.




A PC camera or a CCD camera with 31.7(1¼") sleeve can be attached to the TCA-4 with the 31.7(1¼") eyepiece adapter.

### ◆ Cautions for Imaging

#### ▼Sharp Image

Use a 3-4 magnitude star in order to achieve sharpest focus of an image. Do trial shots with a DSLR camera to determine the best focus of the image. You can use the "live view" function of the camera to focus on a star.

#### ▼Trial Shots

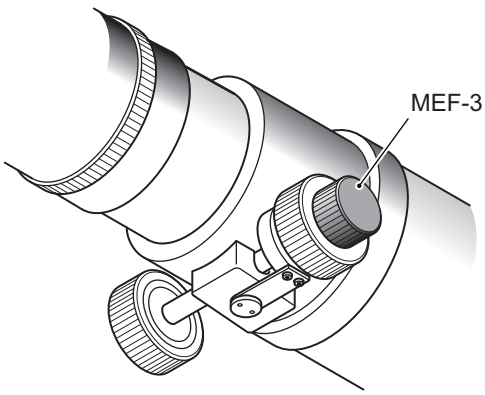
Before heading to a remote place to find darker skies, it is recommended that you take some trial shots in your backyard. Even in the light polluted city area, you can take images with an exposure of one minute or so. This will allow you to confirm the procedures that will achieve the sharpest images for your equipment.

#### ▼Guided Imaging

The quality of the image will depend on guiding. Little or no guiding error in the process of imaging will produce very sharp images. Play or misalignment will ruin longer exposures. Please use a very rigid guide scope system for long exposure imaging.

### ◆ MEF-3

The Micro Edge Focuser, MEF-3, is an optionally available fine focus attachment that permits 8 to 1 focus for critical focusing for imaging or highly magnified viewing.



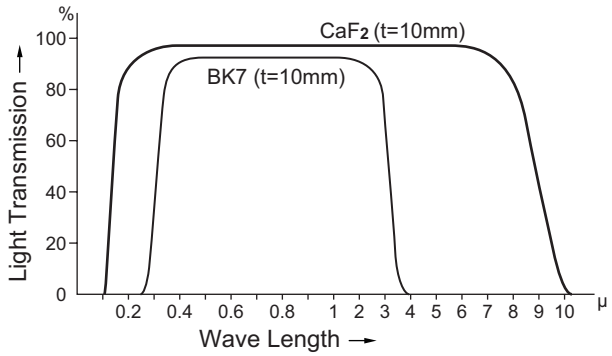
# What is Fluorite?

In 1979, Takahashi became aware of the superior optical performance of a telescope that used a fluorite element so Takahashi started development of a 90mm fluorite telescope in 1979. FOA-60 is a doublet apochromatic refractor that makes the best use of its fluorite element. With less curvature and high resolution, its focal length can be changed freely by dedicated reducer and extender. As shown below, its transmission area and ratio are outstandingly large. In addition, multi-coated element can produce rich illumination from short wave to long wave. Different from reflectors, there is no light loss by the secondary, FOA-60 can produce brighter images even with f/8.8 optical system, which will enable viewing and imaging faint objects.

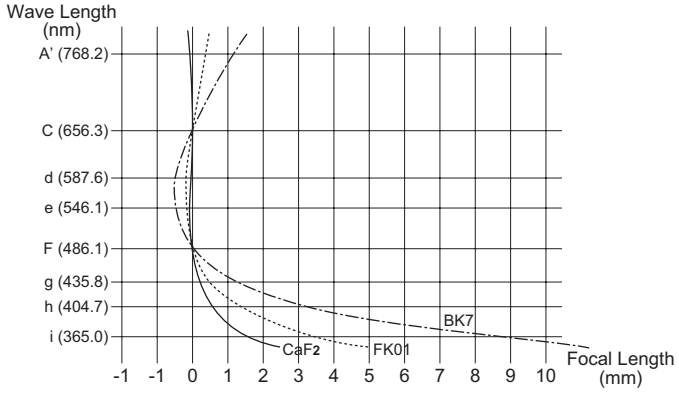
The fluorite element with its excellent performance is used in various high quality objective. Chemically the fluorite element is as hard as optical glass and can be multi-coated for long time use. The focal length can change with fluctuating temperature. So it is advisable to take the telescope out at least 30 minutes before using it to allow it to equalize with the temperature of the outside air to produce stable images. It is good to refocus with a temperature change of 3 degrees C.

The fluorite lens of FOA-60 is multi-coated to harden the lens surface to protect it scratched and is placed at the rear. So there is little chance to get scratches on the lens.

Comparative Diagram (non-coated)




Comparative Color Aberration Curves



# Care & Maintenance

▼**Optical Axis**

Before shipment, the optical axis of your telescope has been precisely adjusted and in normal use it should not require adjustment. On occasion, however, damage or rough handling during transport may cause alignment issues.

If there is an abnormal star image visible with your telescope, immediately contact your local distributor.

▼**Care for the Lens**

If the front lens of the objective has dust or dirt particles on it, use a large hand-powered blower to remove the particles. Under no circumstances should dust be removed by any other means. Rubbing the surface will cause scratches. If the lens must be cleaned, be certain that all dust and particles have been removed by using a blower.

Then using cotton swabs slightly moistened with telescope lens cleaner, dab the surface, changing cotton swabs often until the objective is cleaned.

If any questions arise during this process, immediately contact your local distributor for help. Under no circumstances should the surface ever be rubbed.



**REMEMBER, DO NOT USE ANY FORM OF CANNED AIR TO REMOVE THE PARTICLES.**

Canned air is very cold and could harm the front lens of the objective. Be certain that the dew cap is removed before attempting to clean the objective. Use the procedure above, if the front and rear surfaces of the objective must be cleaned.

# Additional Precautions

▼Minimize large fluctuation in temperature around your telescope. When the telescope is brought out from a warm room to colder air, dew may form.

▼Store the telescope in a cold dry environment. Any dew should be removed by blowing it with a hair dryer with the heat element turned off, which means the air will be at room temperature. This flow of room temperature air will dry the dew and not leave a residue. Additionally, it is a good idea to store the telescope with a drying agent near the objective to prevent moisture issues.

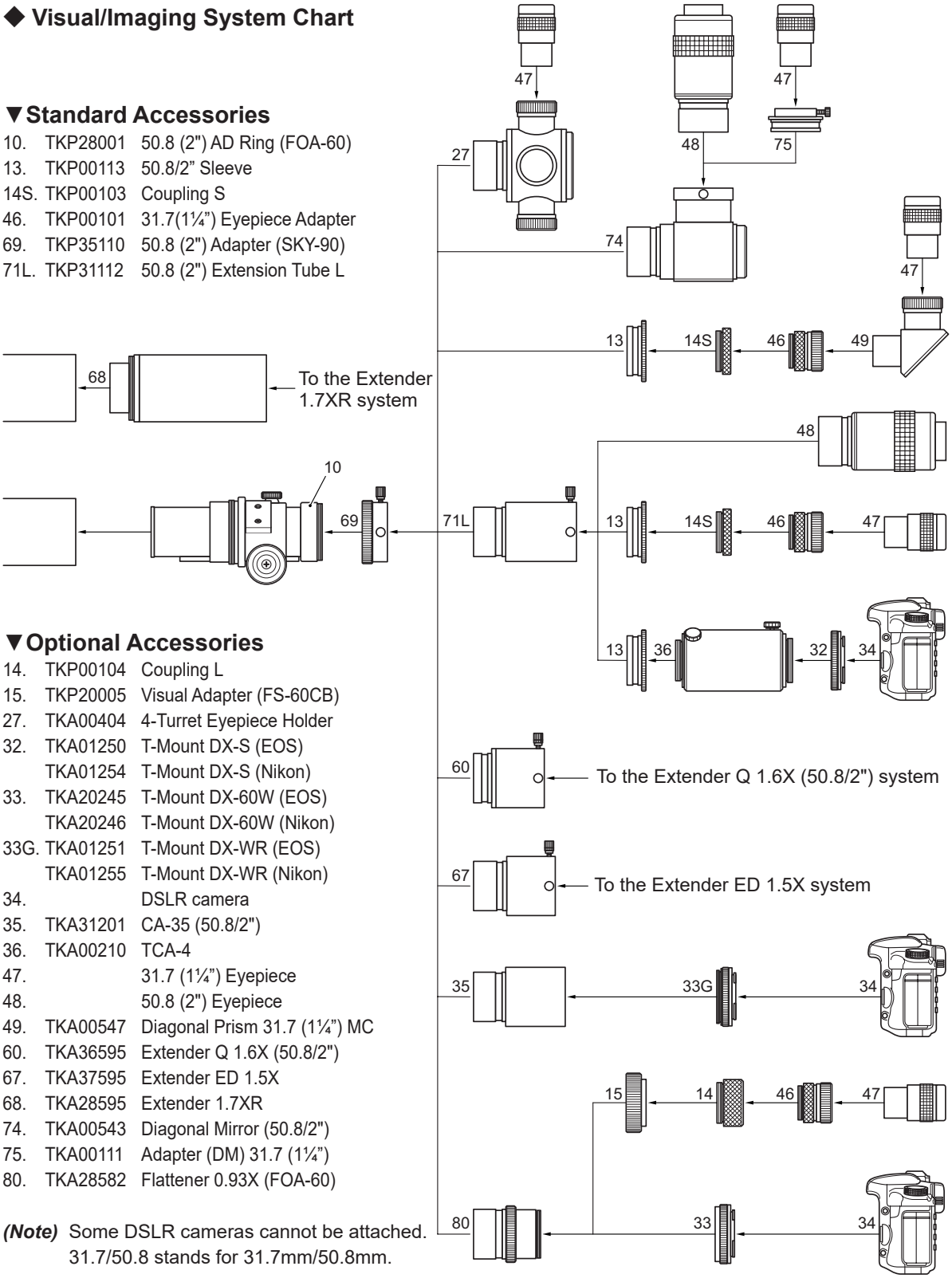


**NEVER USE ALCOHOL TO CLEAN THE LENS. IT WILL DESTROY THE COATING.**

▼Under no circumstances should the lenses be disassembled. The lenses have been properly aligned and set in place by a skilled optical technician with special tools. Movement, removal or disassembly of the lenses will void any warranty on the tube assembly.

# System Charts

## ◆ Visual/Imaging System Chart




### ▼Standard Accessories

10. TKP28001 50.8 (2") AD Ring (FOA-60)
13. TKP00113 50.8/2" Sleeve
14S. TKP00103 Coupling S
46. TKP00101 31.7(1¼") Eyepiece Adapter
69. TKP35110 50.8 (2") Adapter (SKY-90)
71L. TKP31112 50.8 (2") Extension Tube L

### ▼Optional Accessories

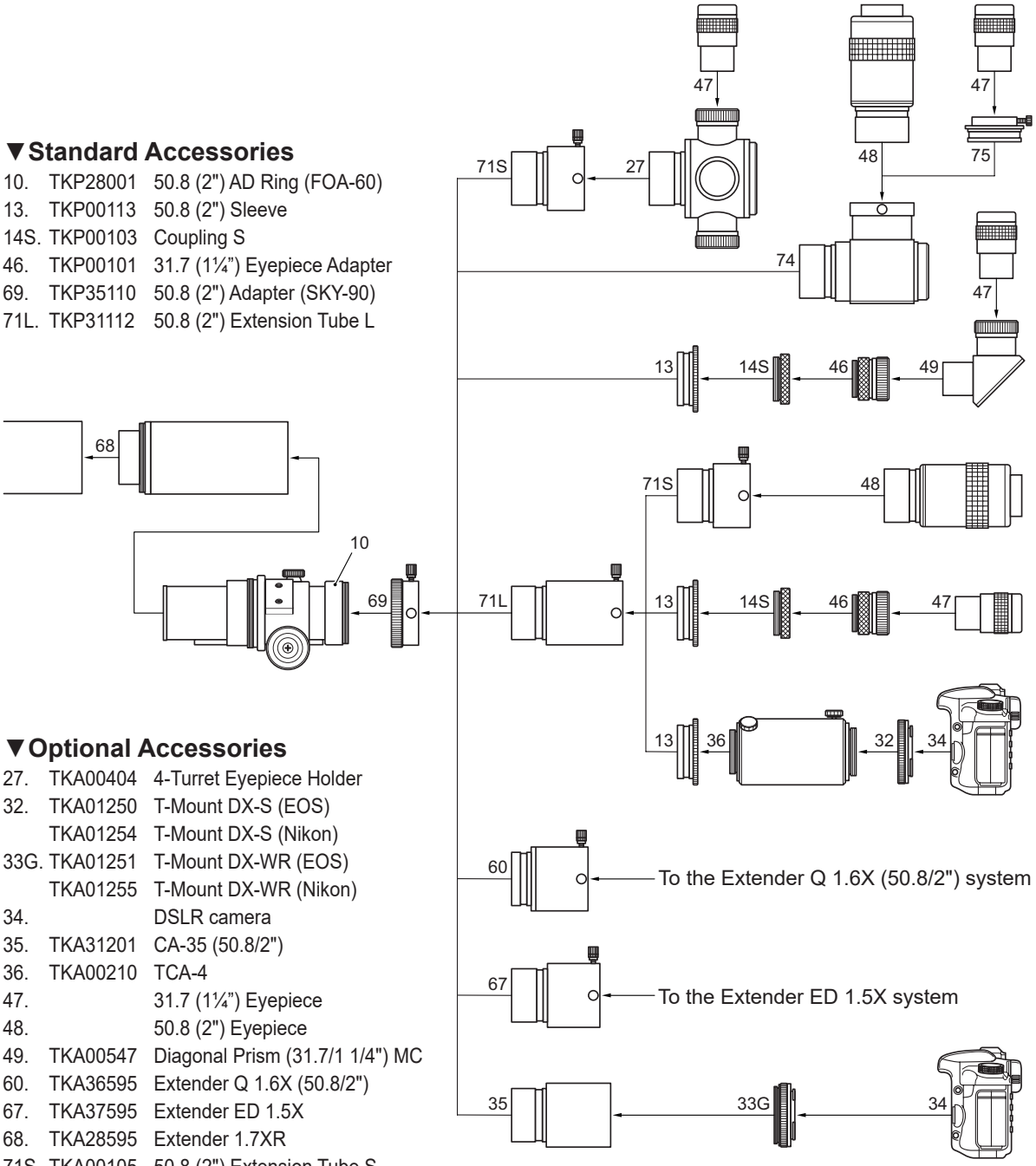
14. TKP00104 Coupling L
15. TKP20005 Visual Adapter (FS-60CB)
27. TKA00404 4-Turret Eyepiece Holder
32. TKA01250 T-Mount DX-S (EOS)
TKA01254 T-Mount DX-S (Nikon)
33. TKA20245 T-Mount DX-60W (EOS)
TKA20246 T-Mount DX-60W (Nikon)
33G. TKA01251 T-Mount DX-WR (EOS)
TKA01255 T-Mount DX-WR (Nikon)
34. DSLR camera
35. TKA31201 CA-35 (50.8/2")
36. TKA00210 TCA-4
47. 31.7 (1¼") Eyepiece
48. 50.8 (2") Eyepiece
49. TKA00547 Diagonal Prism 31.7 (1¼") MC
60. TKA36595 Extender Q 1.6X (50.8/2")
67. TKA37595 Extender ED 1.5X
68. TKA28595 Extender 1.7XR
74. TKA00543 Diagonal Mirror (50.8/2")
75. TKA00111 Adapter (DM) 31.7 (1¼")
80. TKA28582 Flattener 0.93X (FOA-60)

***(Note)*** Some DSLR cameras cannot be attached. 31.7/50.8 stands for 31.7mm/50.8mm.

## ◆ Extender 1.7XR System Chart

### ▼Standard Accessories

10. TKP28001 50.8 (2") AD Ring (FOA-60)
13. TKP00113 50.8 (2") Sleeve
14S. TKP00103 Coupling S
46. TKP00101 31.7 (1¼") Eyepiece Adapter
69. TKP35110 50.8 (2") Adapter (SKY-90)
71L. TKP31112 50.8 (2") Extension Tube L



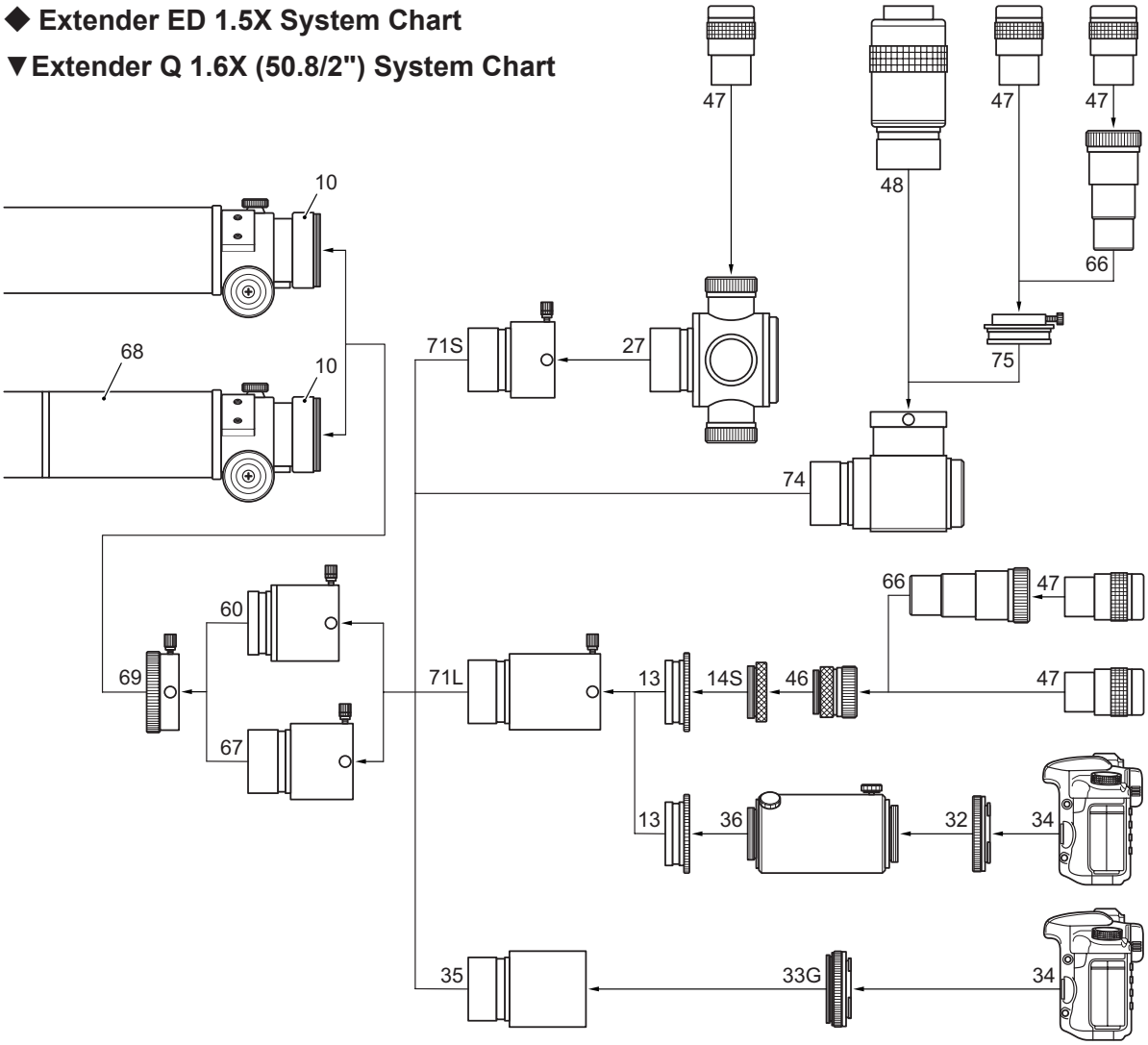

### ▼Optional Accessories

27. TKA00404 4-Turret Eyepiece Holder
32. TKA01250 T-Mount DX-S (EOS)
TKA01254 T-Mount DX-S (Nikon)
33G. TKA01251 T-Mount DX-WR (EOS)
TKA01255 T-Mount DX-WR (Nikon)
34. DSLR camera
35. TKA31201 CA-35 (50.8/2")
36. TKA00210 TCA-4
47. 31.7 (1¼") Eyepiece
48. 50.8 (2") Eyepiece
49. TKA00547 Diagonal Prism (31.7/1 1/4") MC
60. TKA36595 Extender Q 1.6X (50.8/2")
67. TKA37595 Extender ED 1.5X
68. TKA28595 Extender 1.7XR
71S. TKA00105 50.8 (2") Extension Tube S
74. TKA00543 Diagonal Mirror (50.8/2")
75. TKA00111 Adapter (DM) 31.7 (1¼")

***(Note)*** Some DSLR cameras cannot be attached.
31.7/50.8 stands for 31.7mm/50.8mm.

## ◆ Extender ED 1.5X System Chart

## ▼Extender Q 1.6X (50.8/2") System Chart




### ▼Standard Accessories

10. TKP28001 50.8 (2") AD Ring (FOA-60)
13. TKP00113 50.8 (2") Sleeve
14S. TKP00103 Coupling S
46. TKP00101 31.7 (1¼") Eyepiece Adapter
69. TKP35110 50.8 (2") Adapter (SKY-90)
71L. TKP31112 50.8 (2") Extension Tube L

***(Note)*** Some DSLR cameras cannot be attached. 31.7/50.8 stands for 31.7mm/50.8mm.

### ▼Optional Accessories

27. TKA00404 4-Turret Eyepiece Holder
32. TKA01250 T-Mount DX-S (EOS)
TKA01254 T-Mount DX-S (Nikon)
33G. TKA01251 T-Mount DX-WR (EOS)
TKA01255 T-Mount DX-WR (Nikon)
34. DSLR camera
35. TKA31201 CA-35 (50.8/2")
36. TKA00210 TCA-4
47. 31.7 (1¼") Eyepiece
48. 50.8 (2") Eyepiece
60. TKA36595 Extender Q 1.6X (50.8/2")
66. TKA00595 31.7 (1¼") 2X Barlow
67. TKA37595 Extender ED 1.5X
68. TKA28595 Extender 1.7XR
71S. TKA00105 50.8 (2") Extension Tube S
74. TKA00543 Diagonal Mirror (50.8/2")
75. TKA00111 Adapter (DM)(31.7/1 1/4")

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