

**TAKAHASHI Super Apochromat**

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**TSA-102**

**INSTRUCTION MANUAL**

**TAKAHASHI**

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## SPECIFICATIONS

Effective Aperture .....	102mm
Focal Length .....	816mm
Focal Ratio .....	1: 8.0
Focal Length with reducer .....	610mm
Focal Ratio with reducer .....	1: 6.0
Resolving Power .....	1.14"
Limiting Magnitude .....	12.0
Light Gathering Power .....	212X
Image Circle with 35Flattener .....	φ 40mm
Photographic Field with 35Flattener ...	2.8°
Image Circle with Reducer .....	φ 50mm
Photographic Field with Reducer .....	4.7°
Diameter of Main Tube .....	114mm
Total Length of Main Tube .....	890mm
[When the lens shade is retracted] ...	790mm
Weight of Main Tube Assembly .....	abt. 5.4kg
Finder Scope .....	7x50 6.3'

# Tube Assembly Layout

TSA-102S

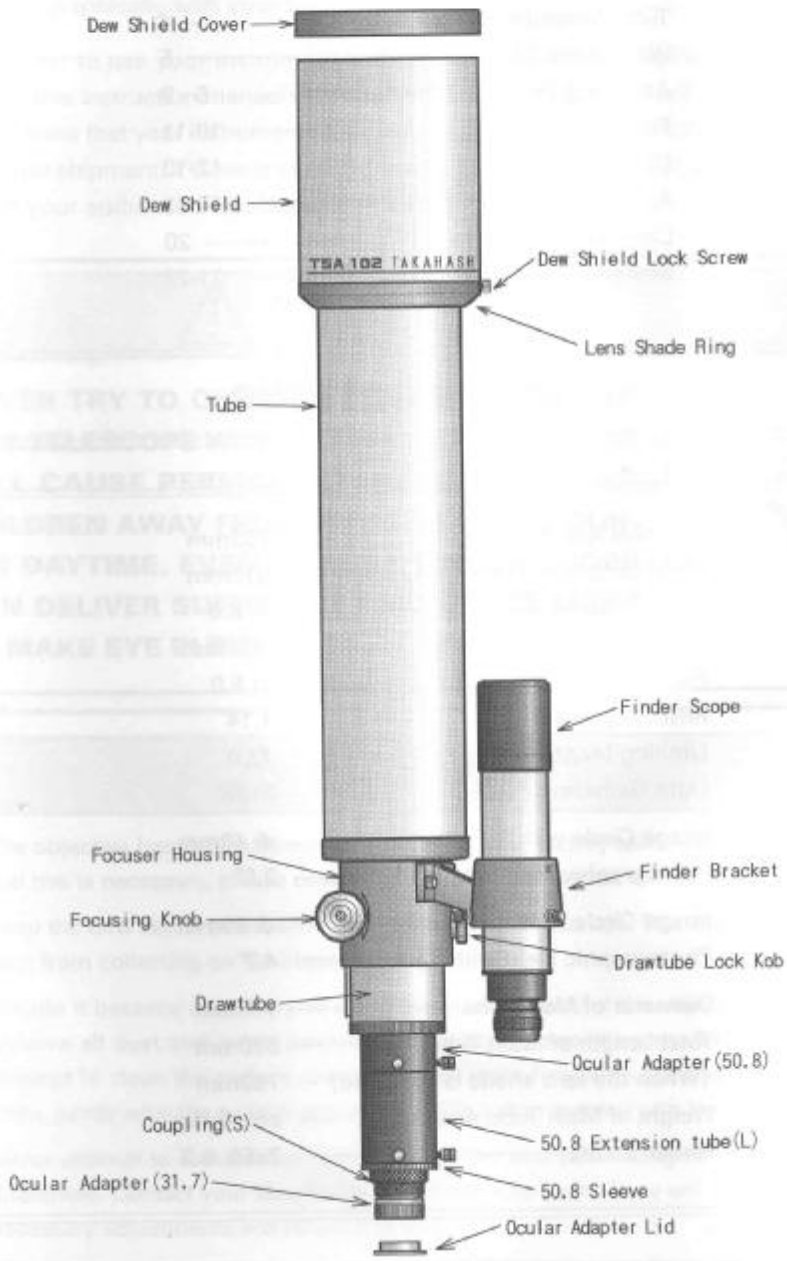


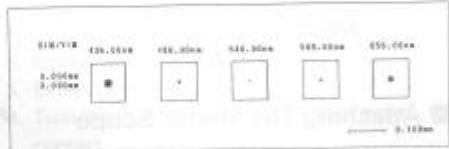
Fig.1

# What Is the TSA-102?

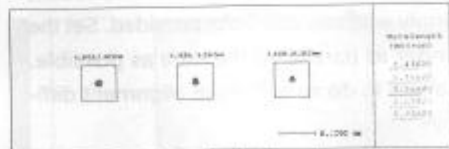
Takahashi has developed a new type of a triplet super apochromat refractor placing a super ED glass in the middle flanked by two crown glasses achieving the top level of optical performance both in visual and photographic applications. Comparing with fluorite apochromat, the color aberrations (halo in the F line and g line) have been reduced to 1/3. Visually, largely weighing the spectral sensitivity of human eye, the Strehl ratio (showing how much percent of the ray is concentrated within the diffraction limited) counts 99.2%, which is almost equal to that of TOA series. Thus, TSA-102 is an ideal photo/visual telescope.

In the photographic applications with a CCD or a DSLR camera, 35-flattener and reducer for TOA series are well matched for use. When used with the 35-flattener, it can produce images of 10 microns across 35mm photo field. In case with the reducer, it can produce a flat field of 10 microns at the center and 20 microns at the edge.

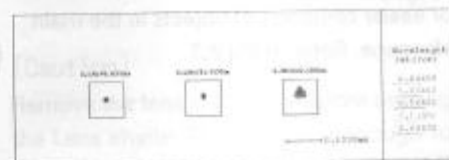
As mentioned in the above, Takahashi is now introducing TSA-102 as a world new standard of light-weighted, compact, and high cost performance telescope.



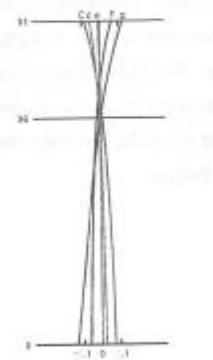
Spot Diagram at the center by wave



Spot Diagram by photographic angle when used with the 35-flattener



Spot Diagram by photographic angle when used with the reducer

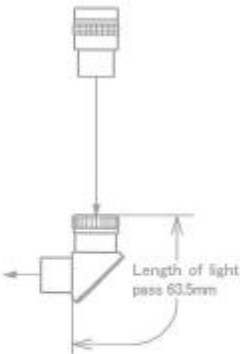


Spherical Aberration Curve

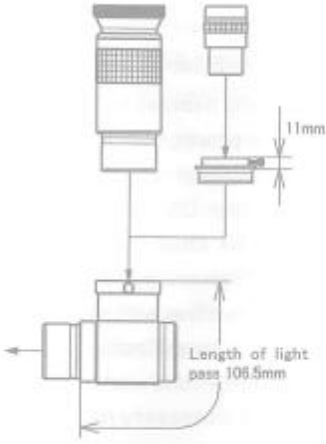
# Accessories for Photo/Visual Application

## ■ 31.7 Compression Ring Diagonal and Mirror Diagonal

Both of these diagonals take up different back focus. This is noted on the diagram. The 31.7 prism diagonal will require the focuser to be racked out further.



31.7 Prism Diagonal Fig. 15



Mirror Diagonal Fig. 16

## ■ 2X Barlow Lens

This Barlow lens was originally designed for the FS Series and it can be used for the TSA for visual use. This short Barlow can be used with the 1 1/4" diagonal or 2" mirror diagonal.

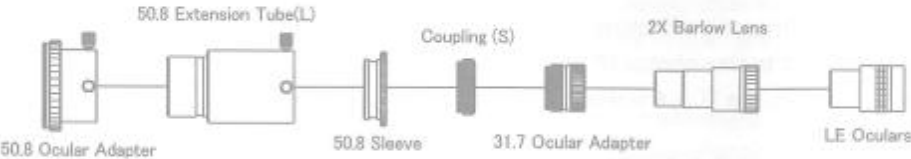


Fig. 17

### ■ 5-Turret Ocular Holder

5-turret Ocular Holder is a unique ocular holder that can attach five different 31.7 oculars to view an object with five different magnifications quickly by turning the holder. Refer to Fig. 18,19.

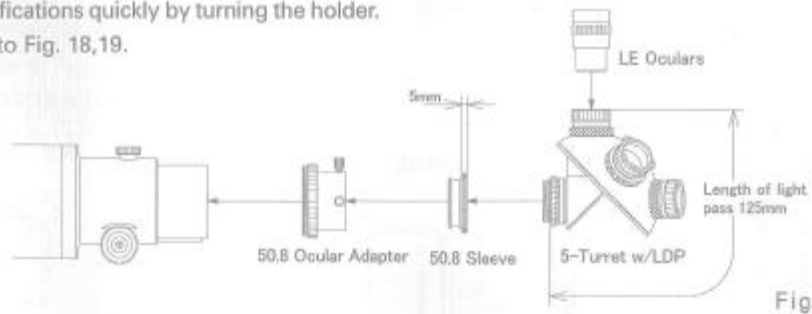


Fig. 18

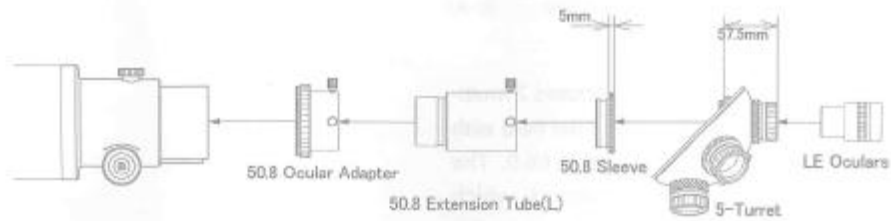


Fig. 19

### ■ Twin Viewer Binocular Viewer

The Twin Viewer is a 45° binocular viewer. The two compression ring ocular adapters insure that the optical axes are all coincidental for the best possible. The built in 2x barlow lens and LE oculars will provide excellent views of the Moon and planets and when the barlow is removed, wide field views of deep space objects.

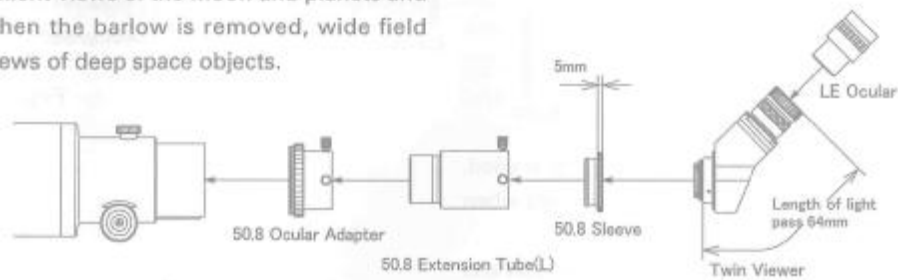


Fig. 20

### ■ 35 Flattener

This flattener is specially designed to produce a flat field for use with a 35mm camera, CCD camera and visual use. It is necessary due to the generous back focus to use the CA-35(50.8).

Focal Length ..... 800mm

Focal Ratio ..... F: 7.8

Image Circle .....  $\phi$  40mm [ 60% illuminated]

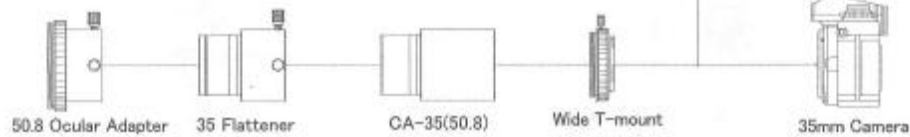


Fig.21

### ■ Reducer

This newly developed reducer uses 2 multi-coated elements to produce a flat field with a faster focal ratio than the f/8.0 to f/6.0. The stars still remain under 20 microns, which make it useful for CCD cameras with smaller chips.

Focal Length ..... 610mm

Focal Ratio ..... F: 6.0

Image Circle .....  $\phi$  50mm [ 60% illuminated]

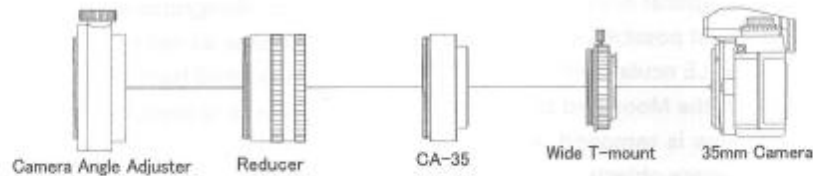


Fig.22

### ■ Camera Angle Adjuster (CAA)

This is necessary when the reducer is used. This can rotate a camera at any angle when photographing.

This CCA can be used with FS-102/128N and TOA-130S in common.

### ■ CA-35

To attach a 35mm SLR/DSLR camera, two different types of the CA-35 can be used for photographing.

- a. CA-35(50.8) for prime focus.  
Refer to Fig. 23
- b. CA-35(TSA-102) for reducer focus.  
Refer to Fig. 24

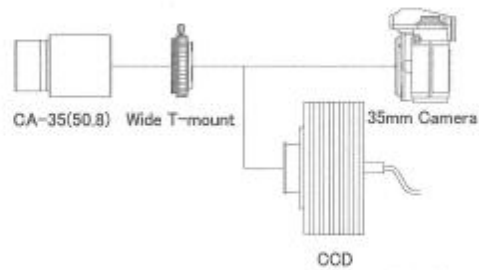


Fig. 23

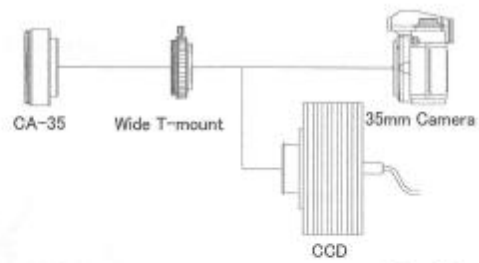


Fig. 24

### ■ T-Mount & Wide Mount T-Adapters

The T-Mount is used to connect to the TCA-4 eyepiece projection adapter for high magnification photos and CCD images of the Moon and planets. Refer to Fig. 25.

The Wide T-Mount can be used for prime focus, reducer, 35-flattener photography. Refer to Fig. 26.

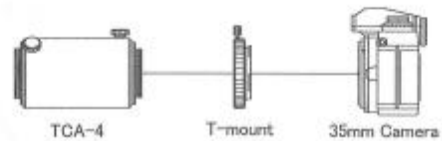


Fig. 25

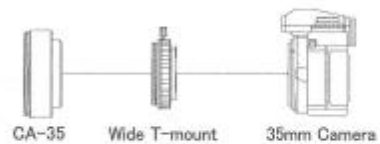


Fig. 26

### ■ TCA-4

This variable eyepiece device attaches easily to the TSA for high quality high magnification photos of the surface of the Moon and planets. It can be used with a film or CCD camera. Refer to Fig. 27.

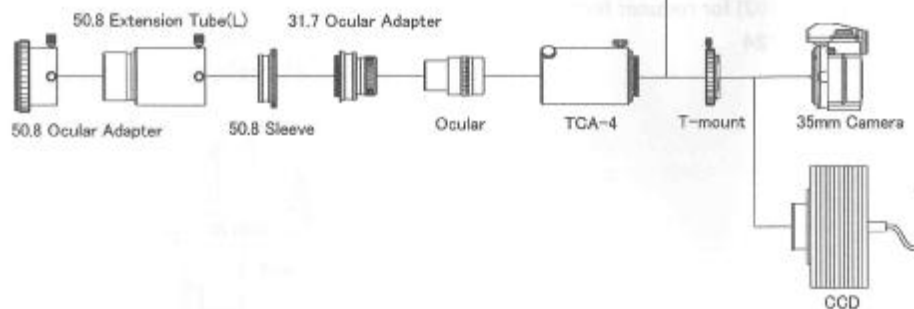


Fig. 27

### ■ MEF-1

MEF-1 can move the focuser finely at 1/10 speed of normal movement. When the small knob is turned, the focuser moves at 1/10 speed for finally focusing and when the larger one is turned, it moves at normal speed.

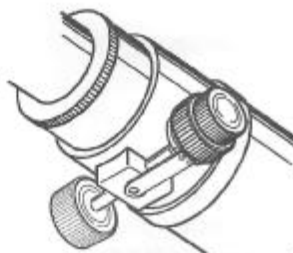


Fig. 28

### ■ FQR-1

FQR-1 is very convenient device to attach and detach the finder quickly. Once it is set on the focuser housing, you can attach and detach the finder quickly by thumb turn screw. The finder alignment remains almost the same in doing so.

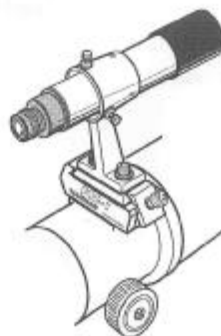
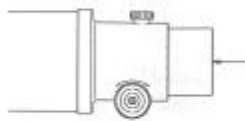


Fig. 29

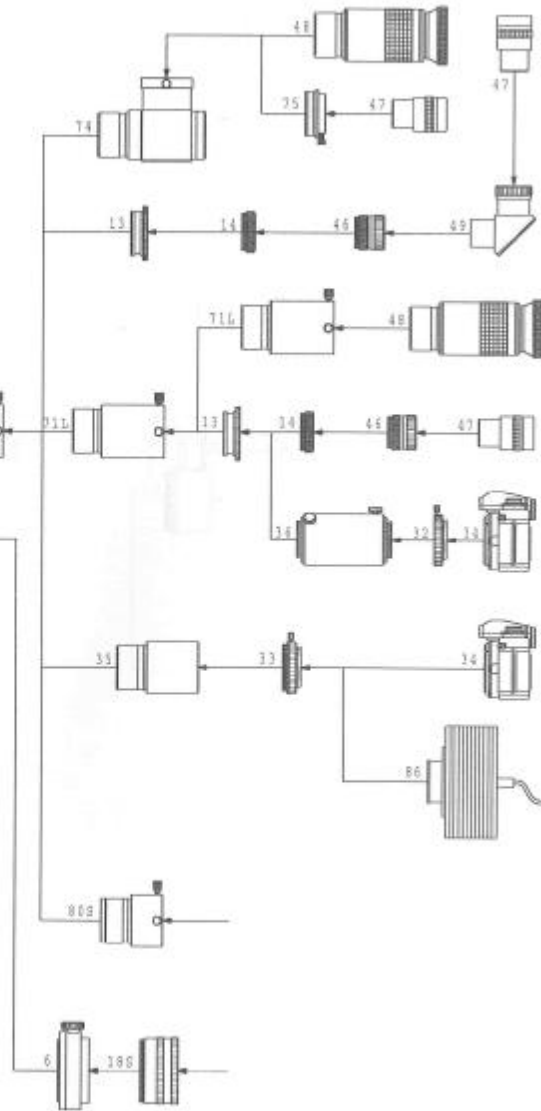
# System Chart

## ■ Photo/ Visual System Chart

- 6. CAA [TKA30200]
- 13. 50.8 Sleeve [TKP00113]
- 14. Coupling (S)[TKA00103]



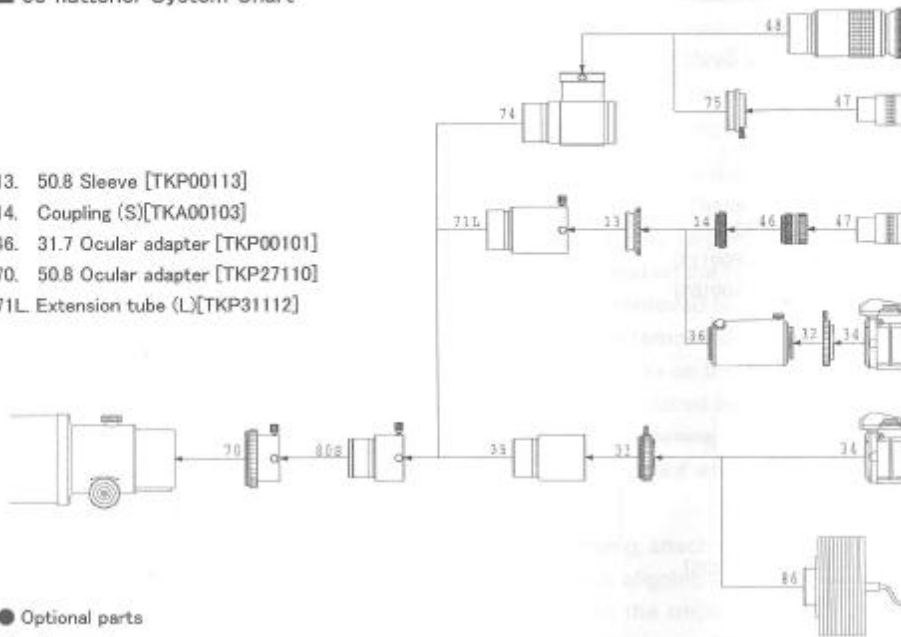
- 18S. Reducer [TKA31580S]
- 32. T-mount
- 33. Wide T-mount
- 34. 35mm camera
- 36. TCA-4 [TKA00210]
- 46. 31.7 Ocular adapter [TKP00101]
- 47. Ocular (31.7)
- 48. Ocular (50.8)
- 49. 31.7 Diagonal prism [TKP00541]
- 60. Extender TOA1.6x [TKA00595]
- 70. 50.8 Ocular adapter [TKP27110]
- 71L. Extension tube (L)[TKP31112]
- 74. Diagonal mirror [TKA00543]
- 75. Adapter (DM)(31.7)[TKA00111]
- 80S. 35 flattener [TKA31582]
- 88. CCD camera



- \* No.13,14,46,70, and 71L are standard accessories for the visual back
- \* Some 35mm SLR/DSLR camera cannot be attached.
- \* Adapter(DM)(No.75) is provided with Diagonal Mirror(No.74).

■ 35 flattener System Chart

- 13. 50.8 Sleeve [TKP00113]
- 14. Coupling (S)[TKA00103]
- 46. 31.7 Ocular adapter [TKP00101]
- 70. 50.8 Ocular adapter [TKP27110]
- 71L. Extension tube (L)[TKP31112]

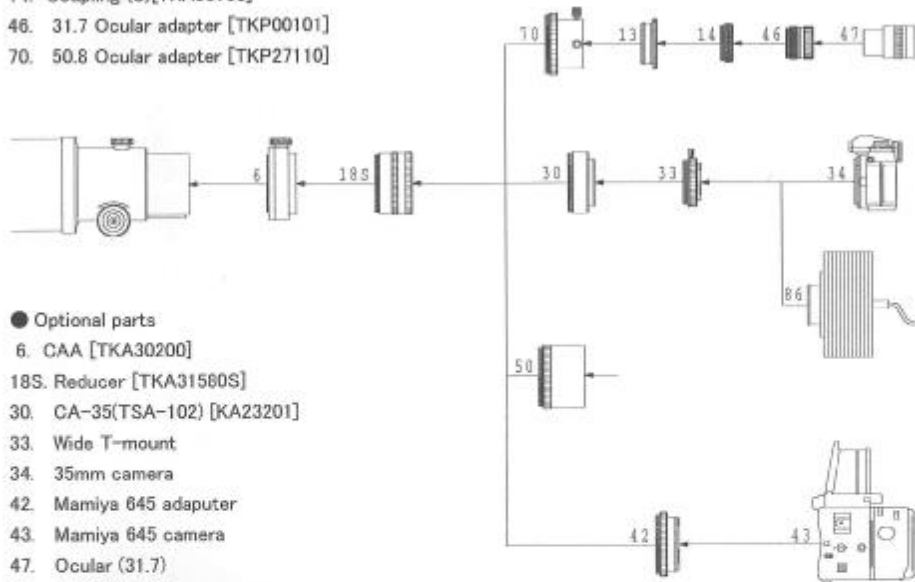


● Optional parts

- 32. T-mount
- 33. Wide T-mount
- 34. 35mm camera
- 35. CA-35(50.8) [KA31201]
- 36. TCA-4 [TKA00210]
- 47. Ocular (31.7)
- 48. Ocular (50.8)
- 74. Diagonal mirror [TKA00543]
- 75. Adapter (DM)(31.7)[TKA00111]
- 80S. 35 flattener [TKA31582]
- 86. CCD camera

■ Reducer System Chart

- 13. 50.8 Sleeve [TKP00113]
- 14. Coupling (S)[TKA00103]
- 46. 31.7 Ocular adapter [TKP00101]
- 70. 50.8 Ocular adapter [TKP27110]



● Optional parts

- 6. CAA [TKA30200]
- 18S. Reducer [TKA31560S]
- 30. CA-35(TSA-102) [KA23201]
- 33. Wide T-mount
- 34. 35mm camera
- 42. Mamiya 645 adapter
- 43. Mamiya 645 camera
- 47. Ocular (31.7)
- 50. Aux. ring(FB) [KA27250]
- 86. CCD camera