



# BAADER TRIBAND-SCT



## Manual and Application Tipps

Thank you for your purchase of a Baader Planetarium TriBand Schmidt-Cassegrain. These telescopes are made for professional observations of the Sun with large apertures (especially in combination with H-alpha-filters) and for narrowband astrophotography.

There are some special things to take in account when observing the Sun with such a large aperture. For best results, we recommend that you spend a few minutes reading this manual before using your new TriBand-SCT telescope.



– EN ver. 05/2023 –



# BAADER PLANETARIUM

Zur Sternwarte 4 • D-82291 Mammendorf • Tel. +49 (0) 8145 / 8089-0 • Fax +49 (0) 8145 / 8089-105  
www.baader-planetarium.com • kontakt@baader-planetarium.de • www.celestron.de

G  
M  
B  
H

# Table of Contents

<b>Scope of Delivery</b> .....	<b>3</b>
<b>Installing the TriBand</b> .....	<b>4</b>
Attaching accessories .....	4
Focussing .....	4
<b>Observing the Sun</b> .....	<b>5</b>
Installing the Heat Shields .....	5
Using a Herschel prism (white light and CaK) .....	5
Using a H-alpha-Filter .....	6
<i>Example Configuration for SolarSpectrum H-alpha-Filter – visual use, M48-System</i> .....	7
<i>Example Configuration for SolarSpectrum H-alpha-Filter – visual use, T-2-System</i> .....	8
<i>Example Configuration for SolarSpectrum H-alpha-Filter – Bino-Viewer</i> .....	9
<i>Example Configuration for SolarSpectrum H-alpha-Filter – for Photography without Reducer</i> ..	10
<i>Example Configuration for SolarSpectrum H-alpha-Filter – for Photography with a Reducer</i> ..	11
<i>Example Configuration for SunDancer TZ3-S, TZ4-S and SunDancer II H-alpha-filter</i> .....	12
<i>Example Configuration for Baader FlipMirror II</i> .....	12
About Magnification and Back Focus of Telecentric Systems .....	13
Tips for Observing the Sun .....	13
<b>Observing Moon and Planets</b> .....	<b>15</b>
<i>Accessories for Observing the Planets</i> .....	15
<b>Observing Deep-Sky-Objects</b> .....	<b>15</b>
<b>Technical Data</b> .....	<b>16</b>
<i>Transmission of the Schmidt Corrector Plate</i> .....	16
<b>Das Schmidt-Cassegrain-System</b> .....	<b>17</b>
<i>Attaching Accessories</i> .....	18
<b>Recommended Accessories</b> .....	<b>19</b>
<b>Collimation</b> .....	<b>20</b>
<b>Cleaning &amp; Care</b> .....	<b>22</b>
<i>Cleaning Eyepieces</i> .....	22
<i>Please note</i> .....	23
<i>Dew</i> .....	23

# Scope of Delivery

The Baader Planetarium TriBand-SCT telescopes are based on Celestron's proven Schmidt-Cassegrains. The original Schmidt plate has been replaced by a corrector plate coated with a TriBand filter, so that the telescope can be used for solar observation (especially with Baader Planetarium and SolarSpectrum H-alpha filters or a Baader Herschel prism) as well as for narrow-band photography, similar to using a UHC filter. It consists of:



- 1 TriBand-SCT (SCT = Schmidt-Cassegrain Telescope)
- 2 Celestron 1¼" Visual Back eyepiece-clamp
- 3 Dovetail (3" CGE-standard)
- 4 Heat shields for the telescopes front ring and the secondary mirror



The heat shields 4 of the 8" TriBand are made of two pieces, those of the larger models are made of four pieces.

# Installing the TriBand

The telescope is connected to the mount like any other telescope via the 3"/CGE dovetail bar. Please note that the 3" Celestron CGE bar is not identical to the 3" Losmandy standard, but is compatible with the 3" clamp of most mounts. If your mount can only accept dovetail bars with the Losmandy standard, you can use one of the following dovetail bars:

- Baader Planetarium Dovetail Bar 3", 470 mm for Celestron # 1501615
- Baader Planetarium Dovetail Bar 3", 530 mm for Celestron # 1501620

Both bars fit for TriBand C8, C9¼ and C11. The longer bars protrude slightly at the back of the C8 to help balance the telescope when attaching accessories such as heavy cameras or a long H-alpha filter with a telecentric system. You may need to remove the telescope's carrying handle for installing the bar.

For the Triband C8, you can also use

- Baader V-Dovetail Celestron-orange anodized, 345 mm für 8" SC/HD #2451734 to use the telescope on mounts with Vixen-style clamps

Longer rails with matching holes are possible as custom-made products.

## Attaching accessories

The telescope has got a 2" adapter thread (SC-thread). The Celestron Standard Visual Back for connecting 1.25" accessories is screwed onto it. The TriBand 11" also has a 3.3" adapter thread.

The 2" SC thread allows you to connect heavy accessories tightly and tilt-proof. For the adaptation of accessories with T-2 thread please use

- Baader SC / HD Ultra Short T-Adaptor, 9 mm optical length #2958500B

For accessories with the standard 2" nose piece, you can install the 2"-SC-Clicklock eyepiece clamp #2956220 at the telescope. This eyepiece clamp fits to all three telescopes. For the 11" model, you can alternatively use the SCL clicklock #295623, which fits the 3.3" thread and allows maximum light transmission.

## Focussing

To focus the telescope, simply turn the focusing knob **1** at the back of the telescope. Counterclockwise rotation focuses on more distant objects, clockwise rotation on closer ones.

As with all telescopes with main mirror focusing, slight mirror tilting may occur when you change the focusing direction (see also page 17/18). Get into the habit of always focusing anti-clockwise last, then the mirror will be clamped sliding on its guide tube and the collimation will also be maintained.

**Tip:** Especially for photography, use a motor focuser such as the Celestron Focusing Motor #821160 to focus vibration-free from your PC or via a Celestron mount with Nexstar hand controller.



# Observing the Sun



**Caution:** The TriBand coating only replaces the Energy Rejection Filter. For solar observation, you absolutely need another filter – either a Herschel prism for white light observation or an H-alpha filter!

## Installing the Heat Shields

The outer heat shields are made of two or four segments, which are clicked together into a ring by strong neodym-magnets.

Remove the telescope's dust cover. To do this, loosen the bayonet lock by turning the dust cover a little bit counterclockwise. Now you can pull it off, put on the heat shield and secure it by turning it clockwise. Place the small, round heat shield on the secondary mirror holder by placing the magnets on the collimation screws. The cover of the collimation screws of the larger models must be opened for this (see p.20).



The TriBand-telescopes with their heat shields

Avoid setting up the telescope for a long time in such a way that sunlight enters the tube without the telescope pointing directly at the sun. The integrated ERF will keep harm from the telescope, but the walls of the tube will heat up unnecessarily.

## Using a Herschel prism (white light and CaK)



TriBand C8 with 2"-Clicklock #2956220  
and Baader Cool Ceramic Herschel prism

We recommend using a 2" ClickLock® clamp #2956220 **1** and the Baader Cool-Ceramic Safety Herschel prism 2" Mark II Photo #2956510P **2** for **observing in white light**. The Solar Continuum Filter included with our Herschel prism can not be used, because the energy reflecting filter blocks the wavelengths around 540 nm. For the necessary further light attenuation, please use either an additional neutral density filter or a single variable polarizing filter (e.g. Baader Single Polarizing Filter 2", #2408342).

For the sharpest possible images, we recommend using a monochrome camera combined with a red

filter such as the Baader RGB R filter 2" #2961603R or the H-alpha bandpass filter 20 nm 2" #2961853. This way you observe in the part of the spectrum that is least disturbed by air turbulence. The 7.5 nm Solar Continuum Filter #2961581, which comes with our Herschel prism, was designed for 540 nm, as most refractors are optimised for this wavelength – with a catadioptric telescope, this restriction is removed and you can use the red part of the spectrum, where there are less air turbulences. The O-III 2" Super-G filter (9 nm) #2961551 with passband at 502 nm also delivers similarly good results as the Solar Continuum filter.

At the other end of the spectrum, in the near UV, the Baader Calcium GEN-II 1¼" #2961590 can be combined with the Herschel wedge to observe the sun in the region of the **calcium K-lines**. This filter may only be used photographically and absolutely requires a Herschel prism or one of the following Baader Digital Solar Filters as a pre-filter:

- TriBand 8": Baader Digital Solar Filter (BDSF) OD 3.8 – 200 mm #2459376
- TriBand 9¼": Baader Digital Solar Filter (BDSF) OD 3.8 – 240 mm #2459377
- TriBand 11": Baader Digital Solar Filter (BDSF) OD 3.8 – 280 mm #2459378

## Using a H-alpha-Filter

Depending on the model, an H-alpha filter can either be screwed directly to the telescope's 2"-thread, or it is connected via the 2" ClickLock clamp #2956220 if it is equipped with a 2" nose piece. Especially with the large SolarSpectrum filters, we recommend the sturdy screw connection to avoid tilting.

On the TriBand telescopes, you do not need an additional energy rejecting filter; otherwise, the operating instructions for your H-alpha filter apply without restriction.

Both the SolarSpectrum filters and the Baader SunDancer II ideally require a focal ratio of f/30 to provide the best H-alpha contrast. Therefore, they need a 3x telecentric system, which increases the focal length of the telescope to 6096 mm (TriBand C8), 7050 mm (TriBand C9¼) or 8400 mm (TriBand C11). Even with a 40 mm eyepiece, you can thus achieve a very high minimum magnification of 150x to 210x with an exit pupil of 1.3 mm in each case and are close to the range of maximum magnification that can be used during the day. By using a SolarSpectrum telecompressor, you can reduce the magnification again behind the H-alpha filter. This is especially useful when using modern CMOS cameras, whose small pixels harmonise better with faster focal ratios. The following telecompressors are available for photography:

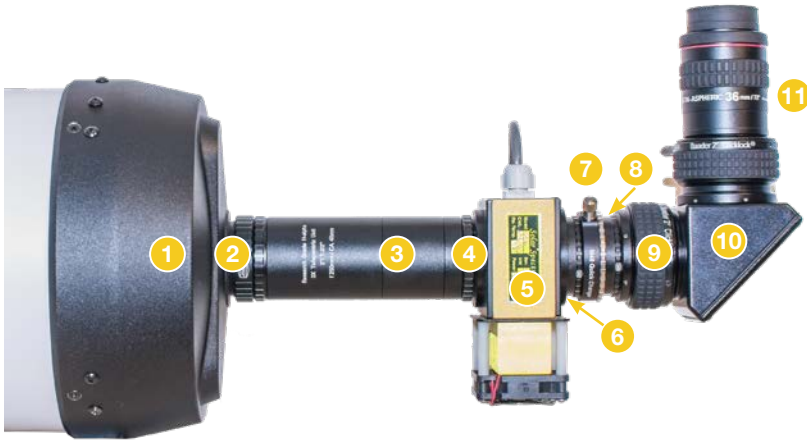
- SolarSpectrum Research Grade H-alpha 0.4x Telecompressor 2" #2459260
- SolarSpectrum 0.7x Telecompressor 2" #2459259

Resulting focal length with 3x telecentric system and telecompressor:

Telecompressor	TriBand 8"	TriBand 9¼"	TriBand 11"
0,4x Research Grade	2438 mm	2820 mm	3360 mm
0,7x	4267 mm	4935 mm	5880 mm

Please note that the field of view is limited by the diameter of the H-alpha filter which is located in front of the reducer.

## Example Configuration for SolarSpectrum H-alpha-Filter – visual use, M48-System



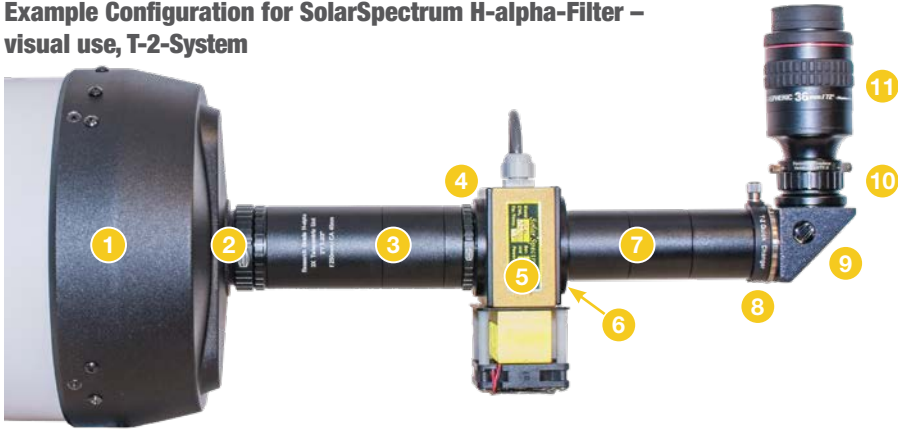
For very large H-alpha filters, it is worth using the M48 system and 2" eyepieces to make use of the entire field of view without vignetting caused by 1¼" eyepieces or T-2 adapters. Smaller H-alpha filters can also be used with 2" accessories, but here the filter diameter limits the visible field of view.

The 2" Research Grade TZ-3 #2459257 has a back focus of 250 mm, although there is some flexibility due to the parallel beam of light. We recommend the following setup for 2" eyepieces:

- 1 TriBand Schmidt-Cassegrain with SC-thread
- 2 #2958243 Baader Ultrashort 2" / 2" Thread-Inverter-Ring, included with the TZ-3
- 3 #2459257 2" Research Grade TZ-3 Telecentric System (3-times extension of the focal length),
- 4 #2958244 Baader Reducing-Ring 2"i / T-2a, with 1.5 mm optical length, included with the TZ-3 – to attach SolarSpectrum-Filters with T-2-thread. Not needed for SolarSpectrum-filters with female SC-thread.
- 5 SolarSpectrum-Filter with female SC-thread on both sides. Filters which only have T-threads on the eyepiece side need in addition the reducing piece M48a / T-2i #2958553, cf. 6
- 6 #2454834 2"a / M48i Zero-length reducing piece (zero optical length) and #2958555 Conversion Ring M48a/M48a. If your filter has got a fixed male T-2-thread, you need Reducing piece M48a / T-2i #2958553 instead.
- 7 #2958593 Baader Heavy Duty M48 Quick Changing System, length 15 mm \*
- 8 2 pieces #2958610 Baader M48 extension tube 10 mm
- 9 #2956248 Baader 2" ClickLock M48i Eyepiece Clamp, length 36,5 mm \*
- 10 Prism diagonal, e.g. #2456117 Baader 2" BBHS® Prism Star Diagonal
- 11 Eyepiece, z.B. #2454636 36 mm Hyperion Aspheric 2" Eyepiece

\*) When using the eyepiece clamp 9, the quick changer 7 can be replaced with M48 extensions, or vice versa. Instead of using 9, the nosepieces of our 2" star diagonals can also be screwed directly onto a M48 extension tube.

## Example Configuration for SolarSpectrum H-alpha-Filter – visual use, T-2-System



For smaller H-alpha-filters with a diameter of 42 mm or less, an adaptation with the T-2-System and a 1¼" or 2" eyepiece clamp can be used.

- 1 TriBand Schmidt-Cassegrain with SC-thread
- 2 #2958243 Baader Ultrashort 2"/ 2" Thread-Inverter-Ring, included with the TZ-3
- 3 #2459257 2" Research Grade TZ-3 Telecentric System (3-times extension of the focal length),
- 4 #2958244 Baader Reducing-Ring 2"i / T-2a, with 1.5 mm optical length, included with the TZ-3 – to attach SolarSpectrum-Filters with T-2-thread. Not needed for SolarSpectrum-filters with female SC-thread.
- 5 SolarSpectrum-Filter with female SC-thread on both sides.
- 5 SolarSpectrum-Filter with T-2-threads. Filter with SC-thread can be attached directly to the telecentric system, without 4
- 6 #1508035 Baader Adapter 2" (male) / T-2 (male) – only for SolarSpectrum-filters with female SC-thread, included with the SolarSpectrum-filters
- 7 Recommended: 3x #1508153 Baader T-2 / 40 mm Extension Tube
- 8 #2456322 Baader TQC/TCR Heavy duty T-2 Quick Changing System
- 9 T-2 prism diagonal, e.g. #2456095 Baader T-2 Star Diagonal (Zeiss) Prism with BBHS® coating
- 10 T-2 eyepiece clamp, e.g. Baader Focusing Eyepiece Holder 1¼" / T-2 #2458125, Baader 2" to 1¼" ClickLock Reducer (T-2 part #15B) #2956214 or Baader 2" ClickLock T-2 (M42i x 0.75) clamp #2956242
- 11 Eyepiece, e.g. #2454636 36 mm Hyperion Aspheric 2" eyepiece – can be used as 2"-eyepiece as well as 1¼"-eyepiece

**Please note:** The perfect working distance of the TZ-3 is 250±10 mm, but in practice the system is very good-natured, so that one or more the three 40 mm extensions #1508153 may also be omitted if desired.

In principle, smaller magnifications (but not a larger field of view!) are possible with a reducer, so that the telescope can also be used with highly visible air turbulence. However, if the exit pupil becomes larger than the pupil of your eye (which is only about



1.5 mm in daytime), you may see the shadow of the secondary mirror as a dark spot, and the distance of the eyepiece to the reducer must be maintained for it to work as desired. Therefore, a long focal length eyepiece is easier to handle for visual use than a reducer.

Typical long focal length eyepieces give you:

	<i>Classic Ortho 32mm</i> 1¼" – #2954132	<i>Hyperion 36mm</i> 1¼" (2") – #2454636	<i>Celestron Omni 40mm</i> 1¼" – #810246	<i>Celestron Omni 56mm</i> 2" – #810248
	Mag.   EP   FoV	Mag.   EP   FoV	Mag.   EP   FoV	Mag.   EP   FoV
TriBand C8	190x   1 mm   0.26°	166x   1,2 mm   0.3° (0.43°)	152x   1,3 mm   0.28°	109x   1,9 mm   0.43°
TriBand C9¼	220x   1 mm   0.22	195x   1,2 mm   0.25° (0.37°)	176x   1,3 mm   0.25°	126x   1,9 mm   0.37°
TriBand C11	262x   1 mm   0.2°	233x   1,2 mm   0.21° (0.31°)	210x   1,3 mm   0.21°	150x   1,9 mm   0.31°

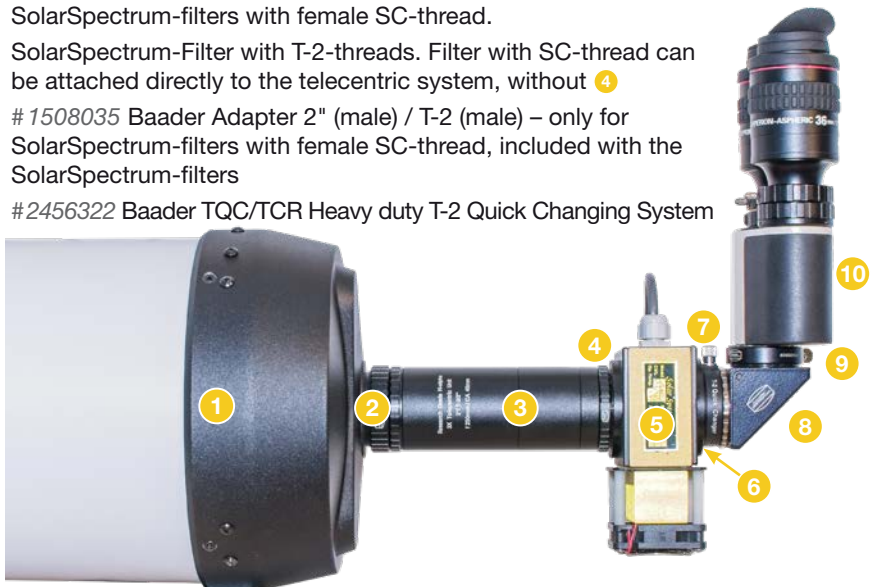
EP = Exit pupil | FoV = Field of View

The field stop of the Hyperion 36 in 1¼" configuration is 32 mm, providing the largest field of view achievable with 1¼". The field stop of a typical long focal length 1¼" eyepiece is a maximum of about 26 mm, that of a 2" eyepiece about 45 mm.

The achievable field of view is determined both by the diameter of the field stop of the eyepiece and that of the H-alpha filter; a longer eyepiece focal length or a 2" nose-piece therefore do not necessarily also provide more field of view.

### Example Configuration for SolarSpectrum H-alpha-Filter – Bino-Viewer

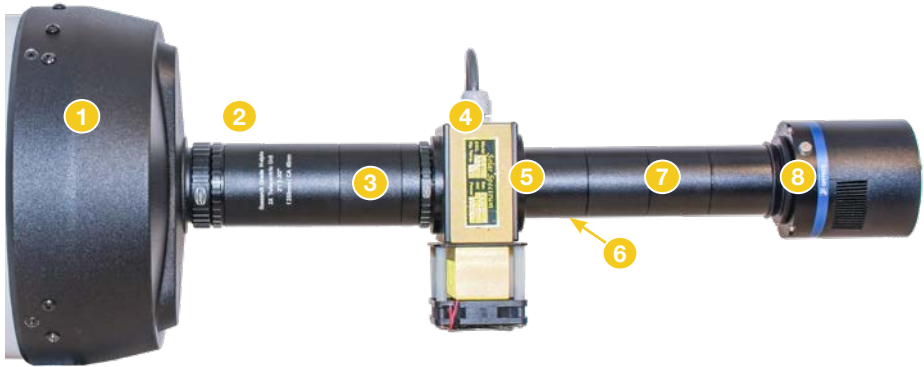
- 1 TriBand Schmidt-Cassegrain with SC-thread
- 2 #2958243 Baader Ultrashort 2" / 2" Thread-Inverter-Ring, included with the TZ-3
- 3 #2459257 2" Research Grade TZ-3 Telecentric System (3-times extension of the focal length),
- 4 #2958244 Baader Reducing-Ring 2"i / T-2a, with 1.5 mm optical length, included with the TZ-3 – to attach SolarSpectrum-Filters with T-2-thread. Not needed for SolarSpectrum-filters with female SC-thread.
- 5 SolarSpectrum-Filter with T-2-threads. Filter with SC-thread can be attached directly to the telecentric system, without 4
- 6 #1508035 Baader Adapter 2" (male) / T-2 (male) – only for SolarSpectrum-filters with female SC-thread, included with the SolarSpectrum-filters
- 7 #2456322 Baader TQC/TCR Heavy duty T-2 Quick Changing System



- 8 T-2 prism diagonal, e.g. #2456095 Baader T-2 Star Diagonal (Zeiss) Prism with BBHS® coating
- 9 #2456313A Baader Heavy Duty T-2 QuickChanger (T-2 part #06A) for bino-viewers with Zeiss dovetail. Not necessary for binoviewers with T-2 knurled slip ring
- 10 Bino-viewer, e.g. #2454636 MaxBright II or #2456410 Mark V Großfeld (Giant)-Binocular, to be used without glasspath corrector

In this configuration, the generous working distance of the TZ-3 shines, and you can observe the sun with both eyes.

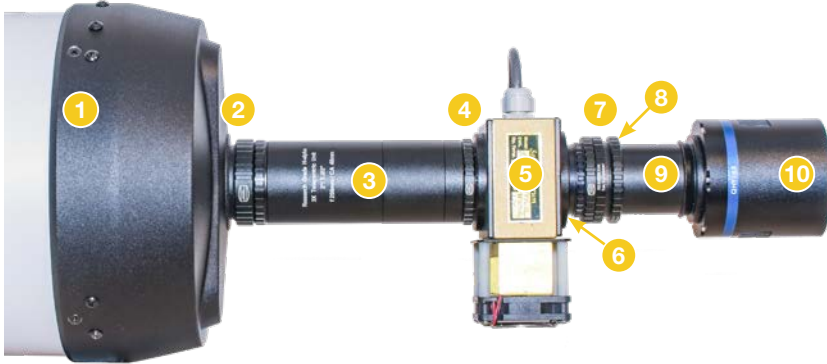
### Example Configuration for SolarSpectrum H-alpha-Filter – for Photography without Reducer



- 1 TriBand Schmidt-Cassegrain with SC-thread
- 2 #2958243 Baader Ultrashort 2" / 2" Thread-Inverter-Ring, included with the TZ-3
- 3 #2459257 2" Research Grade TZ-3 Telecentric System (3-times extension of the focal length),
- 4 #2958244 Baader Reducing-Ring 2"i / T-2a, with 1.5mm optical length, included with the TZ-3 – to attach SolarSpectrum-Filters with T-2-thread. Not needed for SolarSpectrum-filters with female SC-thread.
- 5 SolarSpectrum-Filter with T-2-threads. Filter with SC-thread can be attached directly to the telecentric system, without 4
- 6 #1508035 Baader Adapter 2" (male) / T-2 (male) – only for SolarSpectrum-filters with female SC-thread, included with the SolarSpectrum-filters
- 7 T-2-extensions to set up the camera's working distance. The back focus of the TZ-3 is 250 mm ±10mm. E.g. for a camera with 17 mm back focus and a circa 60 mm long H-alpha-Filter as shown above, you can use 4x #1508153 Baader T-2 / 40 mm Extension Tube.
- 8 Monochrome Camera

**Please note:** You can also integrate a camera tilter or an ADC into the stack of T-2-extensions 7 to avoid Newtonian rings in your images. Cameras with M48-thread can be adapted with a T-2-adapter or using the M48-system as described on page 7.

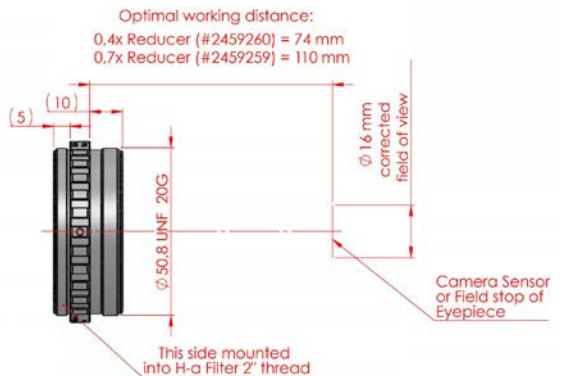
## Example Configuration for SolarSpectrum H-alpha-Filter – for Photography with a Reducer



- 1 TriBand Schmidt-Cassegrain with SC-thread
- 2 #2958243 Baader Ultrashort 2"/ 2" Thread-Inverter-Ring, included with the TZ-3
- 3 #2459257 2" Research Grade TZ-3 Telecentric System (3-times extension of the focal length),
- 4 #2958244 Baader Reducing-Ring 2"i / T-2a, with 1.5 mm optical length, included with the TZ-3 – to attach SolarSpectrum-Filters with T-2-thread. Not needed for SolarSpectrum-filters with female SC-thread.
- 5 SolarSpectrum-Filter with T-2-threads. Filter with SC-thread can be attached directly to the telecentric system, without 4
- 6 In addition *only* for SolarSpectrum-Filters which only have a T-2-thread: #2958110 Baader T-2 Conversion Ring and #2958244 Baader Reducing-Ring 2"i / T-2a, with 1.5 mm optical length. Not necessary for SolarSpectrum-filters with SC-thread
- 7 #2459259 SolarSpectrum 0.7x Telecompressor 2" with 110 mm back focus  
or  
#2459260 SolarSpectrum Research Grade H-alpha 0.4x Telecompressor 2" with 74 mm back focus

Please note the adjacent diagram for the correct orientation of the reducer.

- 8 #2958244 Baader Reducing Ring 2"i / T-2a, with 1.5 mm optical length
- 9 T-2-extension(s) to set the working distance for your camera
- 10 Monochrome camera



## Example Configuration for SunDancer TZ3-S, TZ4-S and SunDancer II H-alpha-filter

The Baader SunDancer TZ3-S #1363070 with 115 mm backfocus and TZ-4S #1363080 with 120 mm backfocus have a combined 2"1/4" nosepiece. For photographic use, a #2956220 SC / HD 2" clicklock can be connected directly to the telescope. For visual use, an additional star diagonal in front of the telecentric is recommended.

The SunDancer II H-alpha filter #2456117 uses a modified version of the TZ-3, with the block filter built into the TZ3-S. To use the SunDancer II with the TZ4-S, this block filter must be moved from the TZ3-S to the TZ4-S. The connection of eyepieces, cameras or reducers is done according to the manual of the SunDancer II.

SolarSpectrum filters do not require an additional block filter when using the TZ3-S or TZ4-S.



Baader SunDancer II with 2" BBHS star diagonal #2456117 for connection to the 2" SC-Clicklock #2956220



The Flip Mirror II behind a Baader SunDancer II (above) and a SolarSpectrum Filter (below, without the additional 40 mm T-2-extensions).

## Example Configuration for Baader FlipMirror II

If you use the telescope both photographically and visually, working with a flip mirror such as the Baader FlipMirror II star diagonal #2458055 becomes particularly convenient. With a flick of the wrist, you can switch between eyepiece and camera. The flip mirror is mounted behind the H-alpha filter via the T-2 thread. An eyepiece can be brought into the same focus position as the camera sensor with the Baader Focusing Eyepiece Hol-

der 1¼" / T-2 #2458125, so that it is not necessary to refocus when looking through the eyepiece. The working distance for the camera sensor at the straight port and for the field diaphragm of the eyepiece at the top port is identical in each case.

With the T-2 quick-release system #2456322, the flip mirror or camera can be rotated into a convenient position, even when the H-alpha filter is screwed tightly onto the telescope.

The SunDancer II with integrated TZ-3S has an ideal working distance of 65 mm, the folding mirror can be screwed directly onto the SunDancer unit. The 2" Research Grade TZ-3 #2459257 has a working distance of 250 mm, here we recommend additionally two pieces #1508153 Baader T-2 / 40 mm Extension Tube.

## About Magnification and Back Focus of Telecentric Systems

In contrast to a barlow lens, behind which the beam of light widens, a telecentric system provides a parallel beam of light. This is necessary for the proper functioning of an H-alpha filter (which requires both at least f/30 *and* a parallel beam for best results). The second advantage of this design is that the distance between camera/eyepiece and telecentric system can also be significantly shortened without noticeably affecting the image.

In practice, you can therefore often also work with fewer extension tubes and a shorter distance. The 2" Research Grade TZ-3 #2459257 is calculated for a working distance of 250 mm, so that it also works perfectly with a binoviewer. But even with a distance of only 180 mm, you will hardly notice any degradation of the image – while the shorter lever means that there is less strain on your mount.

Unlike a Barlow lens, you cannot change the image scale by changing the working distance. For higher magnification (if feasible with your camera's pixel size), instead of a Barlow lens, we recommend our Telecentric System TZ-4 #2459256 (230 mm working distance) or the SunDancer TZ-4S #1363080 (120 mm working distance). Unlike standard barlow lenses, these telecentrics are also optimised for H-alpha observation.



SunDancer TZ-4S #1363080 (left) and TZ-4 #2459256 (right)

## Tips for Observing the Sun

A solar telescope of this size makes special demands on observation conditions. Please take note of the following tips:

- Let the telescope cool down well, and always use the heat shields. With (Schmidt) Cassegrain optics, the light passes through the tube three times, so air turbulences inside the tube are more noticeable than with a refractor. Therefore, avoid that the sun moves out of the centre of the image and illuminates and heats the inner walls of the tube. Do not turn the telescope out of the sun during observation breaks, as then only one side of the telescope will heat up unevenly. It is better to cover it. If you are observing from an observatory, simply close the roof or dome slit so that the telescope is completely in the shade.

- Wait for moments of good seeing. The large aperture leads to a high minimum magnification, so that disturbing influences of bad seeing become visible, which are not noticeable in smaller instruments. Observe the local conditions at your observation site during the course of the day; the air is usually calmest in the morning.
- Keep your distance. Especially for photography, you can set up the control PC at a greater distance behind the telescope. Even sitting next to the telescope can have a negative effect on local seeing.
- Use a good glare shield. Both good eyecups and an observation cloth which is white on the outside and black on the inside and which is pulled over your head are very effective in blocking stray light and increasing the perception of detail.
- Avoid exit pupils that are too large. If the exit pupil is larger than the pupil of your eye (approx. 1.5 mm during the day), you will see the "shadow" of the telescope's secondary mirror floating in the image as a black spot.
- Avoid too small exit pupils when observing in H-alpha. The rule of thumb that the maximum magnification is twice the telescope aperture in millimetres (i.e. an exit pupil of 0.5 mm) does not apply to H-alpha observation because of the longer wavelength. If the exit pupil is much smaller than about 0.8-0.7 mm, the image contrast will eventually break down.
- Use a double polarising filter or a single circular polarising filter to suppress reflections. Some light attenuation can also make it easier to perceive faint structures.
- Some monochrome cameras show conspicuous Newtonian rings on H-alpha filters, which cannot be eliminated even by flats. They are caused by interference in the camera. Sometimes they only appear when observing with (or without) a reducer. There are two ways to eliminate them:
  1. A tilter can tilt the camera so far that no more interference occurs. However, it may be necessary to tilt the camera so much that, with large sensors, even at f/30, parts of the sensor are no longer in the focal plane.
  2. An ADC (Atmospheric Dispersion Corrector) can also effectively eliminate the Newtonian rings and is better suited for this than a tilter. Make sure that the ADC has sufficient free aperture.
- When photographing solar structures, it can be useful to use guiding with an autoguider even for the sun, so that the structures remain centred in the image for a long time. You can connect a guiding camera via the VarioFinder with a suitable solar filter (see p. 19). Software such as SharpCap offers the option of "feature tracking" to also track sunspots.
- Take flats to compensate for dirt on the sensor or on the telescope.



Newtonian rings are the result of interferences in monochrome cameras (here a ZWO ASI120MM).

# Observing Moon and Planets

The slightly different transmission widths of the individual transmission windows result in slightly different exposure times for RGB images for the same brightness. The Baader LRGB filter set needs approximately the following exposure times for same brightness, normalised to the luminance channel:

Luminance: 1x      Red: 2x      Green: 5,3x      Blue: 5,3x

Depending on the camera sensitivity, these values may vary, but they give a good start and should be taken into account for colour weighting.

When taking black-and-white photographs (especially of the moon), it is advisable to use a red filter (e.g. LRGB red filter #2961603R or 20-nm H-alpha #2961853) or the OIII Super-G 9 nm green filter #2961551, as these reduce the influence of air turbulence compared to photography without a filter.

With a colour camera, it must be taken into account that the blue channel in particular is very close to the edge of the visible spectrum. The white balance must be adjusted accordingly. For an automatic white balance, the moon is a good reference.

## Accessories for Observing the Planets

Since the TriBand telescopes are based on classic Schmidt-Cassegrains, you can use any conventional Barlow lens or telecentric system for focal length adjustment, and also the Baader FFC for particularly high magnifications. You will find a selection at [Baader-planetarium.com](http://Baader-planetarium.com).

The heat shields are not necessary for night-time observing, instead you should use a dew cap. The Celestron heat rings (#825912, #825913, #825914) are not compatible with the TriBand, as you will then not be able to insert the heat shields.

# Observing Deep-Sky-Objects

Deep sky observation is possible with the TriBand as usual, but the image is darker because you are already observing with a built-in filter, similar to a UHC filter. For observing objects with a continuous spectrum such as galaxies or star clusters, a normal telescope is therefore better suited.

The TriBand coating is designed for use with narrowband nebula filters and allows the important H-beta, O-III, H-alpha and S-II lines to pass. For RGB images, a little more effort may be required in colour calibration or adjustment of the exposure time of the individual RGB channels.

Using the SC thread or the T-adaptor #2958500B, you can connect filter wheels or the Baader UFC filter slider to the telescope in the usual tilt-proof manner. For optimal image quality, please note the specification of the back focus in the technical data.

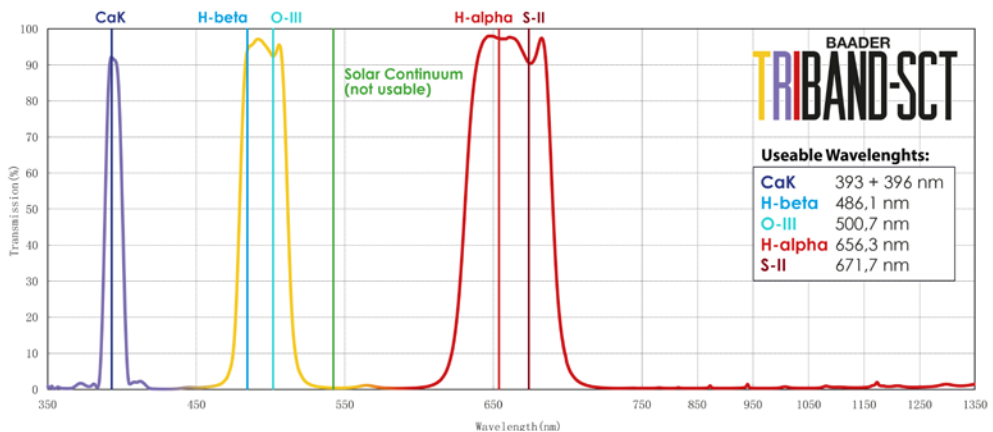
The Baader Planetarium TriBand telescopes are based on the Celestron Schmidt-Cassegrains and can be used like these with the common reducers.



# Technical Data

	TriBand 8"	TriBand 9¼"	TriBand 11"
SKU	# 2301002	# 2301003	# 2301004
Aperture	203 mm (8")	235 mm (9¼")	279 mm (11")
Focal Length	2032 mm	2350 mm	2800 mm
f/ratio	f/10	f/10	f/10
Optical Design	Schmidt-Cassegrain	Schmidt-Cassegrain	Schmidt-Cassegrain
Transmission Range	380 to 400 nm, 480 to 515 nm, 630 to 680 nm		
Accessory Adaptation	2" SC-thread, 1¼" Visual Back	2" SC-thread, 1¼" Visual Back	3,3" + 2" SC-thread, 1¼" Visual Back
Ideal Back Focus	127 mm primary mirror baffle tube lock ring	139 mm from primary mirror baffle tube lock ring	139 mm from 3 in-2 in Reducer Plate / 152 mm from 3 in Primary Mirror Baffle Tube Lock Ring
Secondary Mirror Obstruction	6,9 cm	8,5 cm	9,5 cm
Secondary Mirror Ob- struction by Diameter	33,8 %	36,2 %	34 %
Secondary Mirror Obstruction by Area	11,4 %	13,0 %	11,6 %
Resolution (Rayleigh)	0,69"	0,59"	0,5"
Resolution (Dawes):	0,57"	0,49"	0,42"
Optical Tube Material	Aluminium	Aluminium	Aluminium
Optical Tube Length	43 cm	56 cm	61 cm
Dovetail Bar	3" CGE	3" CGE	3" CGE
Weight	6,25 kg	10 kg	13,1 kg

## Transmission of the Schmidt Corrector Plate



The transmission of the TriBand coating and the position of important emission lines

The corrector is blocked in the IR up to 1400 nm to prevent the tube from heating up.



# The Schmidt-Cassegrain-System

The optical design of the Schmidt-Cassegrain telescope can be seen in the illustration to the right.

The (parallel) beam of light from an observation object enters the tube from the right, passes the Schmidt corrector plate and is reflected by the main mirror onto the secondary mirror.

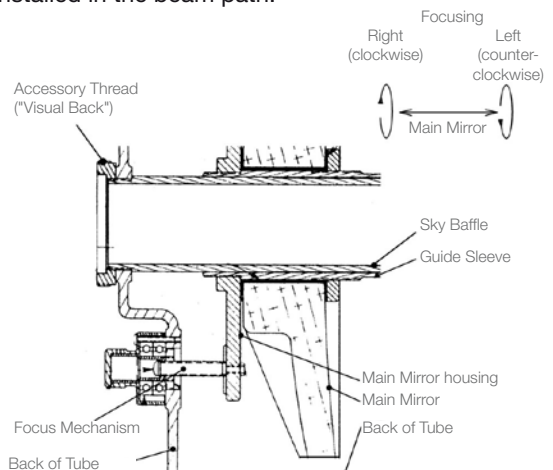
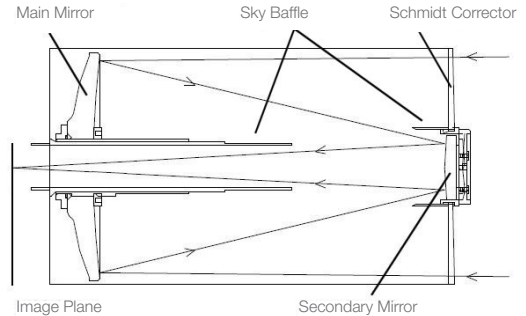
This reflects the beam of light and simultaneously focuses it at the focal point (image plane) of the telescope. The two sky baffles are baffles that also enable low-stray light observations in daylight with a Schmidt-Cassegrain telescope. The tube at the rear end (left in the illustration) also serves as a guide for the main mirror for focusing. The adjustment of the image sharpness (focusing) of different distances of an observation object is achieved with this design by changing the distance between the main mirror and the secondary mirror. The secondary mirror is fixed and the primary mirror is moved back and forth on the sky baffle via a threaded spindle.

The primary mirror has a spherical surface shape, the secondary mirror is also spherically curved, extending the primary focal length of the primary mirror by a factor of 5. The combination of these mirror shapes makes it possible to build relatively long focal length telescopes in mechanically short tube lengths.

Classical, so-called Seidel aberrations (such as coma), which are caused by the combination of a spherical primary mirror with a spherical secondary mirror, are corrected by the Schmidt plate that closes the front tube opening. The image field plane in the focus of the SC system is slightly curved. If the image field is to be flat (planar), an additional optical corrector must be installed in the beam path.

The illustration on the right shows the inner workings of a Schmidt-Cassegrain telescope. It is focused by moving the main mirror (this changes the distance between the main mirror and the secondary mirror changes and thus also the focus position behind the tube end plate).

The main mirror is mounted on an aluminium plate, which in turn is connected to a sleeve. This sleeve slides (lubricated with grease) over the tube of the rear sky baffle (guide). The aluminium plate and thus the main mirror with guide sleeve are connected to the focus screw. A left turn of the focus screw (when



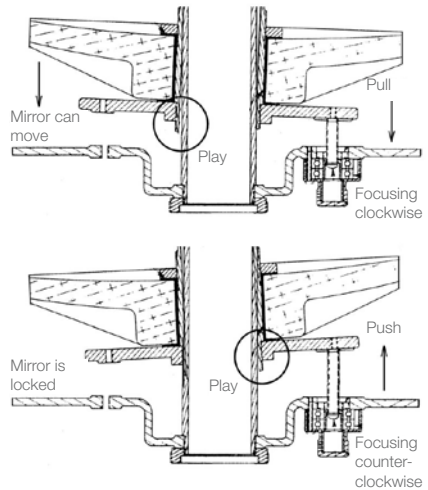
looking in the direction of the Schmidt plate) pushes the main mirror towards the Schmidt plate, a right turn pulls the mirror towards the tube back plate.

Now there must inevitably be some space between the outer diameter of the sky baffle and the inner diameter of the sleeve; otherwise you could not move the sleeve. This minimal difference in diameter (which is sometimes greater and sometimes smaller due to temperature differences) is responsible for the so-called mirror shift. If you turn the focus screw back and forth (left and right), the main mirror tilts minimally (due to the play in the diameters of the guide sleeve and sky baffle) in its position relative to the optical axis. During visual observation, this tilting is noticeable by a slight change in the position of the object of observation in the field of view and is not too tragic.

The situation is different in photography: If the position of the telescope tube changes slowly in the course of the exposure time, it can happen that the main mirror suddenly changes its position and tilts slightly. This results in a change of position of the object of observation in the field of view.

The slight tilting of the main mirror can easily be avoided if you "focus correctly". The picture on the right is intended to illustrate this. "Wrong focus" is when the focus position is adjusted by turning the focus screw to the right. The mirror is pulled back and the play between the sky baffle and the guide sleeve is at the bottom left. If the tube now slowly moves to a more vertical position due to the tracking, the mirror can suddenly slide back a little under its own weight.

In the case of "correct focusing", tilting of the mirror is impossible. If you turn the focus screw to the left (counterclockwise), it pushes the main mirror forward. The play between the sleeve and the sky baffle is now at the bottom right. The mirror mount is practically clamped onto the Sky Baffle with the guide sleeve. This prevents the mirror from tilting.



## Attaching Accessories

**Caution:** For mounting accessories, only the three pairs of pan head screws ①, ② and ③ in the illustration on page 19 may be loosened on the rear tube cell, but not the other countersunk screws. For mounting accessories, you may need slightly longer screws (8/32 UNC, 1/2 inch). Do not use screws that are too long, as they may damage the main mirror. There are one or two screws ④ on the front tube cell which are used to attach an accessory bar (together with the pair of screws ②). We offer matching screws under order number #889001 if no matching screws are included with your accessories.

# Recommended Accessories

We recommend the following accessories to expand the scope of delivery:

- **Baader Standard Base for all Vixen-style finderscope mount bases #2457000**
- **Baader Multi-Purpose Vario Finder 10x60 with MQR IV finder holder #2957465 plus 65 mm AstroSolar Spotting Scope Filter (ASSF) #2459336**

This combination already includes a standard base for mounting the finder on the telescope and serves with the ASSF solar filter as a solar finder. With a T-2 Extension Tube 40 mm #1508153, a camera can also be attached, either for guiding or observing the sun in white light. With the Baader FlipMirror II star diagonal #2458055, it is possible to switch between an eyepiece and a camera.

- **2"-Eyepiece Clamp** for 2"-accessories:
  - For TriBand 8", 9¼" and 11": 2" ClickLock SC / HD (2") Clamp #2956220
  - Alternatively only for TriBand 11": 2" ClickLock SCL (3.3") Clamp #295623
- **Dovetail bars for Mount or Accessories** (Custom lengths on request)
  - 3" Dovetail Bar, 470 mm for Celestron #1501615
  - 3" Dovetail Bar, 530 mm for Celestron #1501620

These dovetail bars are compatible with the 3" Losmandy standard and can also be installed on top of the telescope to attach additional accessories

  - V-Dovetail Bar, 345 mm for 8" SC/HD #2451734 – short dovetail bar to use the TriBand C8 on Vixen-style mounts
  - V-Dovetail Bar, 470 mm for SC #2451101 – extra long dovetail bar to use the TriBand C8 on Vixen-style mounts, and to better balance them. Please note that this bar can only be installed on the upper side of the TriBand C8 – this is not a problem for using the telescope, but then it is upside down, and installing a finder is not practical.
- **Leveling Counterweights** to balance the telescope, are mounted on the dovetail bar:
  - 1 kg leveling counterweight and 3" riderclamp #2451576
  - 1 kg leveling counterweight and V-dovetail clamp, #2451531
- **Celestron Focus Motor #821160**
- **Solar Shade** with drilled hole T-2 #2959279
- **Dew Shield** (only for observations at night, without the heat shields)
  - Celestron Dew Shield DX for C6 & C8 #821128
  - Celestron Dew Shield DX for C9¼ & C11 #821129



The screws for attaching further accessories

## Collimation

The collimation of the optical system is necessary so that the telescope can deliver its best possible imaging performance. The centring of the optical axes of the telescope is guaranteed at the factory by the installation of the primary mirror, Schmidt plate and secondary mirror. The primary mirror in the Celestron SC telescopes is also centred via the guide tube on the Sky Baffle and is not designed to be adjustable. For collimation, therefore, only the secondary mirror must be adjusted via three small screws to the primary mirror. Especially for mobile use, you should check the collimation occasionally, as the setting screws can be slightly misaligned due to shocks or temperature changes.

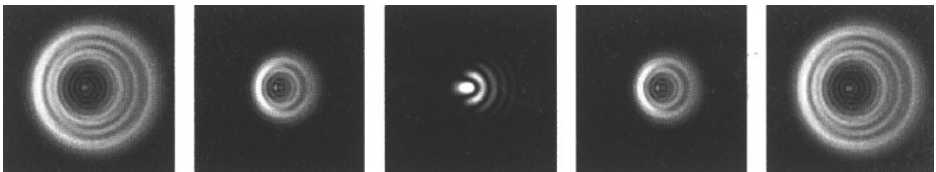


The collimation screws in the secondary mirror mount. On the TriBand C8 they are exposed, on the TriBand C9¼ and C11 they are under a cover flap (left), which you have to turn to expose the screws (right).

The two illustrations above show the position of the respective adjustment screws of the secondary mirror in the centre of the Schmidt plate. The screws of the 8" TriBand SCT are exposed, those of the larger models are hidden behind a cover. They can be accessed by turning the cover.

Collimating a SC telescope is not complicated, but it does require concentration.

Before moving these screws, be sure that the system really needs to be collimated and any unsatisfactory view is *not* caused by seeing effects. The following images show a brighter star through a decollimated SC telescope, at various focus positions. To check, let the telescope cool down (in case of strong temperature differences, e.g. in winter, up to 45 minutes). Then point the telescope at a sufficiently bright star at least 20° above the horizon and use a high-magnification eyepiece (focal length 10 mm or shorter). Turn the focusing knob half a turn to the right or one turn to the left.

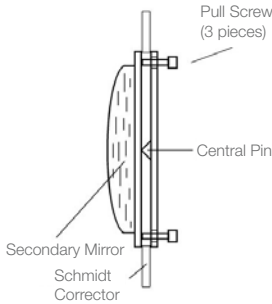


The image series shows the image of a star (from left to right) strongly out of focus (extrafocal), in the middle exactly in focus and on the right strongly in focus (intrafocal). The black eccentric circle is the shadow of the secondary mirror. The decollimation can be recognised by the eccentricity of the shadow.

If the image of a star in your telescope is similar, collimation is necessary. It is best to work in pairs, one person looking through the eyepiece, the second turning the adjustment screws.

During collimation, the two surfaces of the primary and secondary mirrors are placed practically parallel to each other. The secondary mirror must not be tilted against the primary mirror (and thus also against the Schmidt plate).

The TriBand-SC uses a modified version of the usual push/pull screw method to tilt the secondary mirror. Normally, such a system consists of three pairs of 2 screws, each offset by 120 degrees. Then, each pair consists of a tension screw and a pressure screw (usually the main mirror in a Newtonian telescope is adjusted in this way).

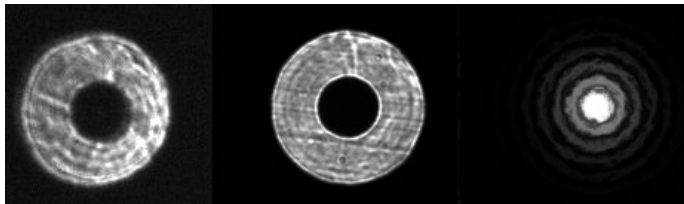


Here, the three pressure screws are replaced by a centring device (see illustration on the left). There are only three pull screws. If one of them is turned to the right, the secondary mirror is tilted in the direction of the respective screw.

It is obvious that if one of the three screws is turned clockwise, the other two must be loosened slightly before the pressure on the other screws becomes too great.

The smallest angular turns of the screws are enough to visibly change the tilt of the secondary mirror. Even a tenth of a turn of a screw has a big effect. At the beginning, the image is very blurred (no matter if extra- or intrafocal). Adjusting one of the secondary mirror screws also shifts the constellation out of the centre of the field of view. The star must be returned to the centre of the image after each turn of the screw.

If the shadow of the secondary mirror is centred (in the case of a very blurred image) the image of the star is moved further into the centre of focus. Now there is often still an eccentricity to be seen and the whole procedure is repeated iteratively until the light of the star is also centred directly in the focus. This completes the alignment.



Extrafocal  
Uncollimated

Extrafocal  
Collimated

In focus  
Collimated

# Cleaning & Care

In general, the principle "less is more" applies to the cleaning of all optics!

Telescopes with a closed tube such as refractors and Schmidt-Cassegrains generally do not need very much care. An occasional cleaning is all that is needed – and all the less often if the telescope is stored carefully.

Over time, dust or moisture accumulates on the front lens. Great care is required to avoid damaging the optics. If dust has settled on the lens, remove it with a camel hair brush or with compressed air. Blow on the lens at a shallow angle for a few seconds. For further removal of stuck dirt, use Optical Wonder Fluid from Baader Planetarium and a soft cloth (Kleenex (!) – no other brand!) to remove any remaining residue.

Wipe from the centre of the lens outwards. Do not rub in circles! Never spray the cleaning fluid onto the lens! Otherwise liquid could flow between the lenses of a refractor or onto the back of the Schmidt plate. Put the liquid on a cloth and then treat the lens with the cloth.



[www.baader-planetarium.com/en/optical-wonder](http://www.baader-planetarium.com/en/optical-wonder)

Occasionally, dew condenses on the front lens or Schmidt plate during observation. This can be removed with a hairdryer or by pointing the telescope at the ground. If moisture condenses inside the telescope, remove the eyepiece holder and store the telescope in a dust-free place with the objective lens pointing downwards. This will eliminate the moisture in the tube.

Alternatively, we offer reusable desiccant that can be filled into small cloth bags and pushed into the eyepiece holder to actively dry the inside of the telescope. Be careful not to drop it into the telescope though!



Silica-Gel, reusable  
#1905160

To minimise the need for cleaning, always place the dust covers on the lenses after using the telescope. Since the eyepiece end of the telescope is open, always put the plastic cap on. This prevents foreign objects from entering the tube.

After a night of observation, always inspect the telescope the next day to see if any residual moisture has remained on the optical surfaces. If necessary, allow the telescope to air open and only then close it dust-tight again.

## **Cleaning Eyepieces**

For eyepieces, the "Optical Wonder Fluid" has also proven to be very effective. Put some fluid on a cloth and rub it over the front lens of the eyepiece. The inner lens element should not be cleaned with fluid. You should only blow it out with a little compressed air if dust particles become annoyingly noticeable when looking through the eyepiece.

### **Please note**

So that you have to clean as little as possible, please note these last important tips:

1. Avoid fingerprints on all optical surfaces at all costs. Fingerprints leave traces of sweat and grease which attack the optical coatings and destroy them over time.
2. Avoid cleaning optical surfaces as much as possible.
3. If cleaning is necessary, use a special soft cloth (spectacle cleaning cloth).
4. Before cleaning, however, always remove dust from the surface to be cleaned with a grease-free brush. Avoid dusting in general
5. Avoid hard knocks or blows to the telescope or mount. Do not try to adjust or turn anything by force. All mechanical and/or electrical movements must be easy to perform.
6. It goes without saying that you should not leave your telescope system out in the rain. Furthermore, avoid – as far as possible – other harmful environmental influences such as car exhaust fumes etc.
7. Avoid dusty locations. During longer observation breaks, cover the telescope and the mount with a plastic sheet (e.g. a large bin liner). Make sure that there is sufficient ventilation to prevent condensation from accumulating. Always cover the objective or light entrance opening and the focuser with the caps provided. Paying attention to cleanliness will save you frequent cleaning.

### **Dew**

In special seasons (spring, autumn) or at unfavourable observation locations (low locations between mountains or close to smaller bodies of water), it can happen that your telescope becomes damp or downright wet in the course of the observation night due to dew condensation.

Likewise, this can happen if you bring the night-cool instrument inside your home. Then place the tube horizontally and cover the telescope with the protective covers only when the moisture has dried off.

[www.baader-planetarium.com](http://www.baader-planetarium.com)

© Baader Planetarium GmbH. All Rights reserved. Products or instructions may change without notice or obligation. Images and illustrations may differ from the original products. We reserve the right of errors. Reproduction of this instruction manual, complete or in parts, only with written permission by



**BAADER PLANETARIUM** G  
M  
B  
H

Zur Sternwarte 4 • D-82291 Mammendorf • Tel. +49 (0) 8145 / 8089-0 • Fax +49 (0) 8145 / 8089-105  
[www.baader-planetarium.com](http://www.baader-planetarium.com) • [kontakt@baader-planetarium.de](mailto:kontakt@baader-planetarium.de) • [www.celestron.de](http://www.celestron.de)

