Instruction Manual
and Tips + Tricks
for the

Baader Cool Ceramic Safety (CCS) Herschel – Solar Prism

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Instruction Manual
Baader CCS Herschel-Prism

The BAADER 2" **COOL-CERAMIC SAFETY (CCS)** Herschel-Prism for white light Solar observation, including ceramic Solar finder screen and 2" ClickLock® eyepiece clamp.

There is no better – and most of all no safer – way for unparalleled visual and photographic contrast for white light Solar observation.

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1. SAFETY INSTRUCTIONS

Solar observation in white light (the Solar photosphere – Sun spots, Solar granulation and Solar faculae) is one of the most interesting activities in astronomy. However this kind of observation may be dangerous, if the device is being handled incorrectly. Improper use may cause damage to the eye – even complete blindness. For this reason please read these safety instructions carefully.

The Baader Safety Herschel-Prism was designed specially for Solar observation with refracting telescopes (also see below). Any commercial refractor with an aperture ranging from 90 to 110mm (e.g. Celestron Omni-XLT series refractors) will already show all visible Solar phenomena accessible to the Astro amateur.

The Baader Safety Herschel-Prism is a professional accessory for the serious amateur. Using it requires responsible handling.

Following precautions apply for visual observation:

- Do not use this product if you do not feel well informed about possible hazards and the consequences of wrong handling. If you have questions, please contact us.
- Never remove the pre-mounted neutral-density filter (#2458332) 1:1000 (OD 3.0), except for eyepiece projection photography (see pages 5-6).
- Always mount the Baader Safety Herschel-Prism onto the focuser before aiming the telescope at the Sun.
- If more than one telescope is attached to your mount, be sure that the lenses of all other optics – except for the one utilizing the Baader Safety Herschel-Prism – are being carefully and securely covered to exclude any Solar radiation entering unnoticed into any other telescope or finder scope pointing towards the Sun.
- Never will you leave this instrument – or any telescope – unattended during the day-time respectively during Solar observation, especially with inexperienced observers and/or CHILDREN.
- Children especially must be prevented from using this instrument on their own, without expert supervision! This device is not a toy. It is not intended to be used by children under 13 years of age.
- Maximum telescope size: We have used the Herschel prism succesfully with telescopes with 6 and 8 inch aperture. Because of the huge amount radiation, we recommend to point the telescope away from the sun when you do not observe - make a break every hour or so to give the equipment time to cool down. The limiting factor for the focal length is the 2” adaption. The image of the sun in the image plane is ca. 1cm per 1m focal length, so focal length should not be longer than ca. 4,5m. If you can project the sun with your telescope and a 2”-focusser, you can also use the Herschel prism.

The Baader Safety Herschel-Prism features a ceramic window which works as Solar finder screen and “heat cage“ at the same time. Due to the closed design of the magnesium prism body there is no dangerous amount of light exiting the Baader Safety Herschel-Prism. Due to this improvement the Herschel-Prism evolves into a safe device for Solar observation – even and especially for educational purposes.

Following precautions apply for photographic observation:

- Never remove the pre-mounted neutral-density filter (#2458332) 1:1000 (OD 3.0) for prime focus imaging (see page 9)
- When checking focus during focal- or eyepiece projection photography, make sure that the image of the sun is not too bright. In case the image appears too bright, use a neutral density filter (#2458245 1:64 OD=1.8) and hold it between your eye and the camera.

1.1. Additional important advice

1. Never mount any filter into the front 2” nosepiece of the Baader CCS Herschel-Prism. During Solar observation the full energy of the Sun reaches the CCS Herschel-Prism unabated. For this reason any additional filtering or reduction of light must never happen in front of the Herschel-Prism since the heat load would be so large that any filter mounted in this place would be shattered immediately (in the exact focus of an unfiltered 6” refractor at f/6 to f/15 temperatures up to 600°C are being measured).

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2. In case of using the photographic version of the CCS Herschel-Prism for visual application the user must make absolutely sure that the neutral density filter OD 3.0 (#2458332) is mounted in the correct place directly above the Herschel-Prism in the beam of light that is exiting from the Herschel-Prism into the eyepiece. This ensures that no harmful amount of energy can enter into the eye of the observer. However it will be necessary to further reduce Solar light for reaching comfortable brightness. This is being achieved either by adding a Solar Continuum filter, alternatively by using appropriate neutral density filters of the photographic version or by using a polarizing filter as explained on page 8/9.

3. The Baader Safety Herschel-Prism is an accessory which is to be used in combination with refracting telescopes only. Any other optical designs (like Newton, SC, MAK and so on) use optical or mechanical parts near the focal plane, which will be destroyed by the heat of solar radiation. If you want to utilize any reflective telescope for solar observation, shield the front aperture with our patented Baader AstroSolar safety film. You will find all information on AstroSolar safety film on our website:
http://www.baader-planetarium.de/sektion/s46/s46.htm or www.protecsolar.com

4. Never use welding glasses, emulsion film or similar auxilliary aids for filtering Solar light. All these means are not designed to fully shield off dangerous radiation of the IR or UV part of the spectrum.

Please note: Baader Planetarium GmbH cannot be held liable for consequences of wrong handling of the Baader Safety Herschel-Prism during Solar observation.

If you do not understand any part of this manual or if you have questions regarding the handling of the Baader Safety Herschel-Prism, please contatct us: Tel.: (+49) 8145 8089-0, Email: kontakt@baader-planetarium.de.

2. INCLUDED IN DELIVERY, TECHNICAL DATA & IMPORTANT OPTIONAL ADAPTERS

Adaptation options facing the telescope (included in delivery as standard):

- 2" (50.8 mm) nosepiece with safety notch (do not use M48 filter threads!)
- 2" (50.8 mm) female thread into the prism housing
- circular dove tail (circular groove) S58 x 3.7mm at the front end of the prism body
- Female thread within the prism body itself, measuring M55 x 1mm
- Optional telescope adapters are available for Carl Zeiss M 68 and various other thread standards

Adaptation options facing the eyepiece side:

- 2" (50.8 mm) ClickLock® clamp with brass-clamp-ring (included in delivery)
- Optional: T-2/2" adapter with 2"(M48) Filterholder. Replaces the 2" SC-ClickLock® clamp. Shortens the backfocus 47mm – see paragraph 4.6

Optical length: 114mm in the delivery condition

Weight: 530 gram

Prism Body: Dye-cast magnesium, machined; flat black anodized; pearl white painted

The Baader Safety Herschel-Prism contains the following accessories:

2.1. Visual version (# 295 6500 **V**):

- Baader Safety Herschel-Prism with 2" nosepiece and 2" Baader ClickLock® eyepiece clamp
- #2458332 2" Neutral Density filter OD 3.0 (1:1000, transmission 0.01%)
- #2458391 2" Baader Solar Continuum filter

Both filters are pre-mounted above the Herschel-Prism itself (see page 5-6). If you wish to observe with 1¼" eyepieces, use a reducer adapter 2" to 1¼" or remove the 2" ClickLock® eyepiece clamp and exchange it against optional Astro T-2 system part #27 (#1508035 2"/T-2 thread adapter and 2" filter holder) and add one of several optional 1¼"/T-2 eyepice holders. For various 1¼"/T-2 eyepiece holders see our website:
http://www.baader-planetarium.de/sektion/s08/s08.htm

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2.2. Photographic version (# 295 6500 **P**):

-Baader Safety Herschel-Prism with 2“ nosepiece and 2“ Baader ClickLock® eyepiece clamp
-#2458332 2“ Neutral Density Filter OD 3.0 (1:1000, transmission 0.01%),
-#2458391 2“ Baader Solar Continuum filter
-additional one of each 2“ Neutral Density filters, OD 0.6 (#2458321), 0.9 (#2458322) and 1.8 (#2458331).

The Baader Solar Continuum- and the Neutral Density filter OD 3.0 are pre-mounted into the prism-body in the as-delivered-condition.

3. THE OPTICAL PATH WITHIN THE SAFETY HERSCHEL-PRISM

The graphic below shows the optical path within the Baader Safety Herschel-Prism. The Solar light enters into the prism body from the right and falls onto the 45° inclined first prism surface. Approx 4.6% of Solar light are being reflected into the eyepiece or camera respectively. The much larger percentage of light (95.4%) exits the rear face of the prism and would form a focal point outside of the prism body.

The exiting beam in the Baader Safety Herschel-Prism is fed into a separate “heat cage” which is sealed with a special heat-absorbing ceramic tile. Like on a space shuttle the ceramic tile traps the radiant energy without overheating its surroundings. The body of the Baader Safety Herschel-Prism is closed on all sides which prevents any danger of contacting direct Sunlight, making it safe for educational work. Since the “heat cage” is separated from the prism body and only connected with four screws, there is virtually no heat distribution extended into the prism itself.

The translucent ceramic tile also acts as projection screen showing an unfocused image of the Sun. Aiming the telescope at the Sun is now esier than ever before.

The 2“ ClickLock® clamp securely clamps any 2“ eyepiece or 2“/1¼“ reducer with only the small rotation of a lever. You can change eyepieces with only one hand even in winter with heavy gloves.

IMPORTANT ADVICE:

Due to production standards, the 2“ nosepiece in front of the Baader Safety Herschel-Prism features a 2“ (M48) filter thread. However - never attempt to mount any 2“ filter in front of the Herschel-Prism! Any filter mounted into the full beam of Solar energy so near to the focus will become extremely hot and will be damaged within seconds (see safety advice, page 3). Each and every filter must be mounted above the exiting side of the prism.

3.1. The pre-mounted filters in the prism body
(also see 4.6)

Both versions of the Baader Safety Herschel-Prism (visual and photographic) are equipped with two 2“ filters mounted above the exiting side of the Herschel-Prism. Mounted directly above the prism is a 2“ Solar-Continuum filter (#2458391), with the strongly reflecting surface facing the prism. Above that – i.e. directly in front of the eyepiece or camera – a neutral density filter OD 3.0 (1:1000) #2458332 serving as energy reducer. This orientation of filters ensures a Solar image free of unwanted reflections.

The Illustration to the right exemplifies the filter arrangement.

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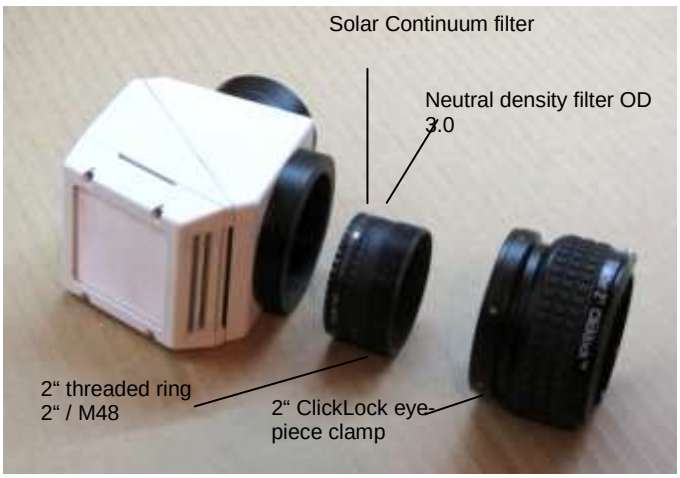

For changing filters unthread the 2“ Click Lock® clamp from the prism body. Now seperate the connecting threaded ring 2“/M48. This ring serves as connecting element to attach the 2“ Click Lock® clamp onto the prism body and additionally as filter holder up to three standard 2“ filters.

The 2“ Solar Continuum filter may be removed and exchanged against another neutral density filter. As detailed earlier (page 3), the OD 3.0 filter #2458332 must only be removed during photographic observation and exchanged against one of the other neutral density filters supplied with the photographic version of the Baader Safety Herschel-Prism to achieve shortest possible exposure times.

3.1.1. 2″ Threaded Ring
(included in delivery)

The 2” threaded ring has got a continous external thread without a stop collar. This also assures that the ring becomes loose as soon as the 2”-SC-Clicklock is removed. If there was a mechanical stop in the external thread, it could get jammed with one of the parts and make changing filters harder. With this loose construction you can even use up to three Baader low-profile-filters (LPFC) directly above the prism.

Two LPFC-filters are pre-mounted when the prism is shipped, and the ring is ca. 5mm above the housing. This way you can use e.g. an optional 2”-LPFC-Polarizing-filter (page 9) with a 2”-eyepiece: The eyepiece will fit completely into the Clicklock without touching the thread inverter.

If you mount three filters at the thread inverter, its upper end has to be ca. 11mm above the housing. This means of course that eyepieces can't be inserted as deep into the Clicklock as before, and an eyepiece with an additional filter may not fit completely into the Clicklock.

You must be careful when screwing the threaded ring into the housing: Make sure that the filter doesn't hit the prism!

The prism itself is protected by a small felt cover, so that the metall shall not hit the glass, but be careful anyway.

We ask you to be carefull when changing filters - avoid damages, and remember that you are working with precision optics!

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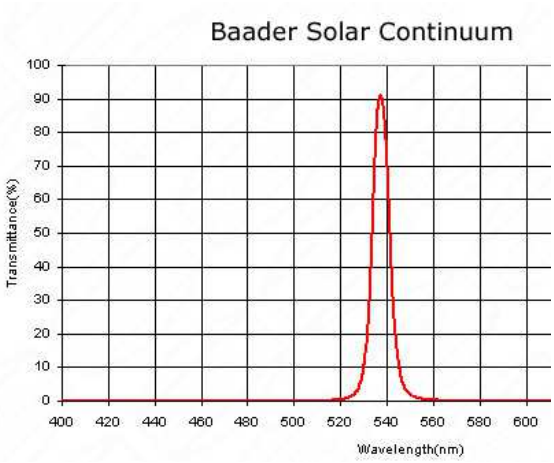
3.1.2. Baader 340 nm / 10 HBW Solar Continuum Filter
(included in delivery)

The **Solar Continuum filter** is a true narrowband filter featuring 10nm half-bandwidth (HBW) at the passband of 540nm at the same time supplying maximum spectral transmission. This has following advantages for Solar observation:



Most achromatic doublet objectives used in Astronomy are not corrected equally well across the full visual spectrum (actually they have a noticeable color error). For such lenses the Solar Continuum filter isolates the very spectral range where these objectives are well corrected. This will yield best possible contrast and sharpness for economy refractors: All other colors are completely eliminated. This narrowband filtering (brightness is no problem) results in a much higher contrast of the sun's surface, and you can use much higher magnifications.

Additionally, Solar granulation is most contrasty in that very spectral range around 540nm.

At the same time, the Baader Solar Continuum filter greatly improves seeing conditions by supplying a steadier Solar image because the short portion of the Solar spectrum below 535nm is being blocked (thermally induced seeing effects become less prominent with longer wavelengths of light).

When using apochromatic (fully color corrected) APO-refractors (e.g. Astro Physics, TEC, Zeiss) the Solar Continuum filter may be removed, in order to observe the Sun in integral white light with the same contrast as is only achievable using the Solar Continuum filter when observing with ordinary achromates.

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4. OBSERVATION TECHNIQUES

In case you acquired a Baader Safety Herschel-Prism around 2010 it will enable you to observe a complete Solar cycle streching approximately across the next 11 years. At the moment, the Sun appears virtually “blank“. However the amount of Sun spots should greatly increase within the year 2010 to reach a climax during maximum activity, approximately 2015/2016.

Tips and Tricks:

Especially when observing the Sun, seeing plays an important role because the atmosphere heats up much more during the day especially in summer.

Depending on the location there is a specific daily cycle of seeing conditions normally from better to worse and back. According to experience, there are two preferable observation windows during the day – namely in the early morning before the atmosphere gets heated up and late in the afternoon (before sunset) while the atmosphere is slowly and continuously cooling down.

Important also is the type of landscape overlooked with the telescope. When looking over territory abundantly covered with vegetation (parks, forrests) or large lakes or sea, seeing conditions will be much improved compared to looking over “chaotic” terrain like city-rooftops. For regular repeated Solar observation it is important to register the “seeing cycle” for the chosen location.

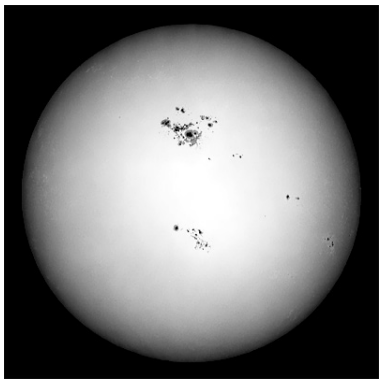
Two additional considerations in order to improve seeing conditions – i.e. image quality:

- Using the Solar Continuum filter as detailed above
- Every time when not observing, the optical axis of the telescope should not be facing the Sun, in order to enable the air trapped within the telescope as well as the Herschel-Prism to cool down.

4.1. Visual observation

- **Limb darkening**

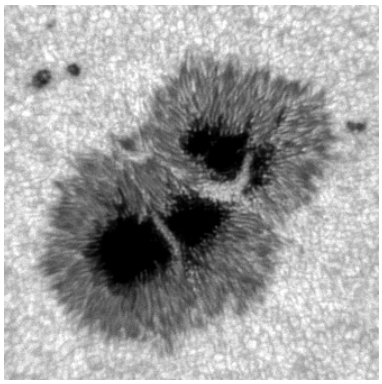
  Limb darkening of the Sun is a constant Solar phenomenon and immediately visible when aiming the telescope at the Sun. Limb darkening is caused by the fact that the Sun consists of hot gas whose temperature is reducing towards the surface. Looking at the middle of the Sun means to look onto the hottest and deepest region. Looking at the edge however shows less dense and consequently less bright regions. Were the Sun a solid body, no limb darkening could be observed.



- **Sun spots**

  Sun spots consist of a core region (Umbra) and a brighter surrounding region (Penumbra). Sun spots are cooler (approx. 4000°C) than the undisturbed Solar face (ca. 5500°C). At this locations magnetic storms are bursting through the granulated photosphere.

  All Sun spots go through a detailed cycle – normally from a small single spot evolving into a complex group of spots developing distinct magnetic north and south poles. Changes in these complex groups are the fastest moving changes observable in the Solar system. Complex changes may take just minutes, making the Solar observation in white light so very interesting.



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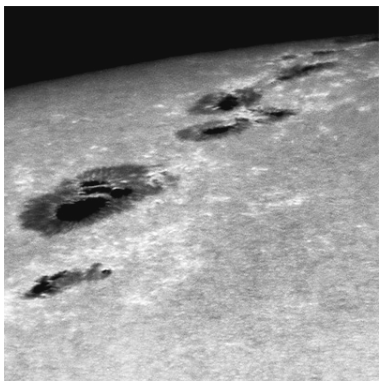
Additional phenomena:

1. Light bridges
2. Umbral dots
3. Penumbral filaments
4. Schuelen – Wilson phenomenon



- **Photospheric faculae**

  Faculae are being recognised as bright areas within the Solar surface and usually are grouped around Sun spots. These faculae regions are hotter than the rest of the Solar photosphere. During observation in integral light with a Herschel-Prism such bright regions are mainly visible near the limb of the Sun, since the area appears darker than the central regions (see page 8)

4.2. Tipps for visual observation:

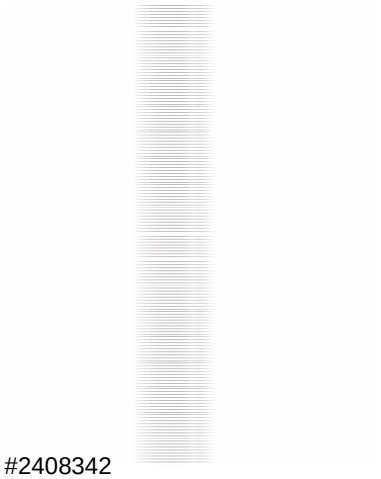
- **Check for correct filtering:**

  If the Solar image appears too bright, e.g. when using a short focal refractor, when using very low magnification or after having removed the Solar Continuum filter (so that only the OD 3.0 filter remains in the beam of light) it is mandatory to add an additional neutral density filter instead of the Solar Continuum filter. We offer three additional neutral density filters, OD 0.6 / 0.9 / 1.8 – each being available in 2" or 1¼" size in order to reach a convenient brightness of the Solar image. See filter selection on our website:
  http://www.baader-planetarium.de/sektion/s39/s39.htm

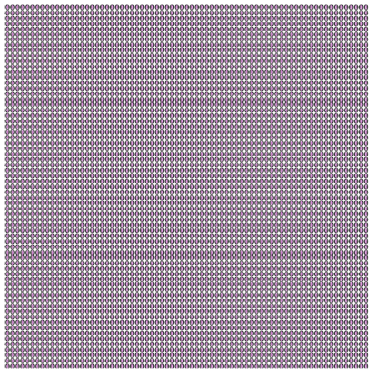
- **Continuous variation of brightness using Baader Polarising filters**

  The light reflected from the Herschel-Prism surface is already partly polarized. For this reason a single polarizing filter can be mounted directly onto the 1¼" or 2" nosepiece of any eyepiece allowing to vary the image brightness just by rotating the eyepiece.

  This allows an exceedingly easy way to adjust brightness for any observing conditions, be it summer or winter, clear or partially overcast sky, focal ratio of telescope and eyepiece magnification. 2" and 1¼" Single Polarizing filters can be found on our website:
  http://www.baader-planetarium.de/sektion/s38/s38.htm



#2408342
2" Single Polarizing filter



#2408343
1¼" Single Polarizing filter

- **Binocular Solar observation**

  The Baader Safety Herschel-Prism in principal enables binocular vision.
  The "stereo" vision of the Sun – for instance using our Mark V or or our Maxbright Binocular
  viewer is a very special experience as the Sun appears stereoscopic. We will gladly guide you to find out if and how you can use a binocular viewer in combination with your telescope and the Baader Safety Herschel-Prism (also see the adapter system drawing at paragraph 4.5 and chapters 4.6 and 4.7).

4.3. Photographic observation (see 4.6)

Solar photography is divided into prime focus imaging and Solar projection photography. In any case the sensor in use today is the CCD chip, chemical emulsion photography has virtually disappeared. Phenomena observed are the same as detailed in chapter 4.1.

Also check paragraph 4.6: how to shorten the backfocus.

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- **Prime focus imaging (= direct connection of CCD or DSLR-camera body without camera lens)**

Prime focus imaging is being applied when the complete Sun is to be imaged. As shown in the image to the right the camera body is being connected onto the Baader Safety Herschel-Prism using a standard 2"/T-2 nosepiece and T-mount ring.

Rule of thumb for calclating the size of the Solar image on the chip plane:

* APS camera chips: 1000mm focal length of the telescope will provide approx. 10mm diameter of Solar image on the chip.

Initially leave the OD 3.0 neutral density filter as well as Solar Continuum filter mounted inside the Prism body. Attach the camera and choose b/w mode. Exposure times (at moderate ASA/ISO settings of 125) should be around 1/1000 sec. This ensures that seeing (air movement) will be almost "frozen". If 1/1000 sec exposure times are not achieved, exchange the OD 3.0 filter against a filter with OD 1.8 (#2458331) in order to shorten exposure time.

- **Afocal photography (= using a fixed-lens digital camera)**

Afocal photography mostly is applied, if no DSLR camera is available and the camera used is equipped with a non-removable zoom-lens. Afocal photography is a special version of projection photography. It can be applied for imaging the complete Solar disc as well as for enlarged views of Solar regions. The changing of so-called equivalent focal length is being effected by varying the zoom factor of the digital camera lens.

Information concerning necessary accessories for afocal photography can be found on our website:
http://www.baader-planetarium.de/sektion/s15/s15.htm

For more information concerning the techniques of afocal photography, please visit:
http://www.baader-planetarium.de/sektion/s15/kundenreferenz/afokales_projektiv/infoseite-projektiv.htm

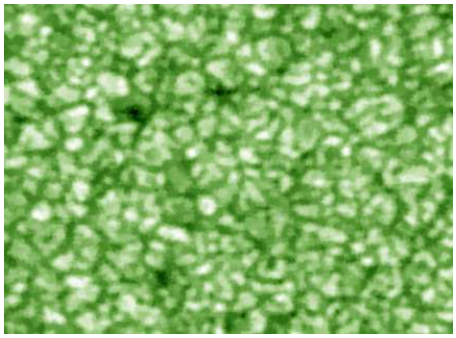
- **Projection photography**

This method for Solar photography is used for detailed imaging of Solar granules or individual Sun spots. In this case the focal image of the Sun is being projected onto the imaging chip similar to projection techniques used in a slide projector or beamer, see also:
http://www.baader-planetarium.de/sektion/s16/s16.htm

In this case a projection system is being required which causes exposure times to increase exponentially. For this kind of Solar photography, webcams and video cameras are preferable which allow a stream of images to be stacked. Also see:
http://www.baader-planetarium.de/dmk/dmk_start.htm

Suitable projection lenses are:

- Eyepieces with low distortion (preferable Ortho eyepieces)
- Eyepiece holding systems such as Baader **OPFA** systems
- Alternatively Baader **FFC** – Fluorid Flatfield Converter, see also page 17 and
  http://www.baader-planetarium.de/sektion/s30/s30.htm



Whereas the Baader FFC will provide the highest known contrast and sharpness of any projection eyepiece or barlow lens, owing to its two fluorite doublet lens groups.

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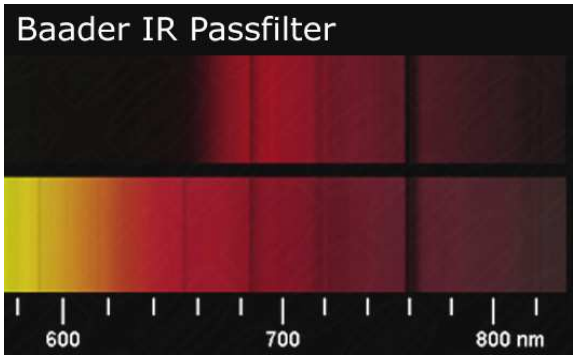
For initial test images using DSLR cameras, a simple barlow lens or existing photographic teleconverter may be used, which roughly doubles the telescope focal length.

Important advice:

For each and every type of projection photography – be it by barlow lens, eyepiece projection, teleconverter projection or with FFC – the projection device must be mounted above the Herschel Prism. It is not possible to use any cemented lenses in front of the Herschel Prism as they will be damaged beyond repair within seconds.

4.4. Tips for photographic observation



Photography in prime focus mode requires very short exposure times which keep seeing effects quite low. However when using projection photography exposure times significantly increase together with the equivalent focal length. This greatly increases the influence of seeing effects such as air turbulence.

As mentioned before seeing effects are depending on wave length, stronger in the blue wing of the spectrum and less prominent in the longer wave length in the red end of the spectrum. For this reason it can be beneficial to only image in the red spectral range. Many successful Solar imagers are using a **Baader IR-Passfilter** (#2458386) in order to minimize seeing effects – the same technique is being applied for planetary imaging. When using an IR-Passfilter, the Solar Continuum filter must be removed from the path of light. Also see:
http://www.baader-planetarium.de/sektion/s34a/s34a.htm

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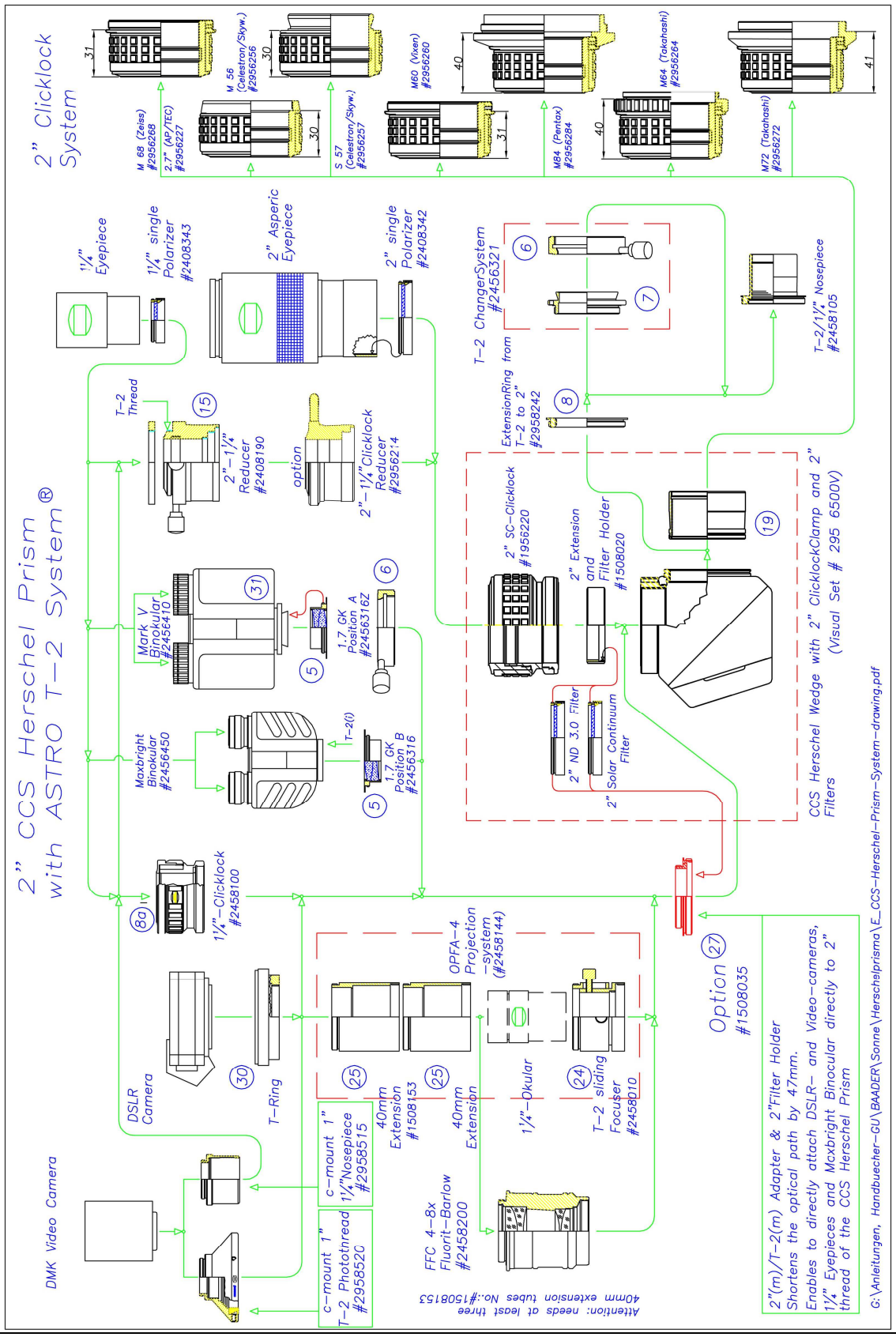
4.5. The Herschel-Prism in combination with the Baader Astro T-2 system

This diagram shows combinations of the Baader Safety Herschel-Prism with the Astro T-2 system™. It may be downloaded in high resolution from: http://www.baader-planetarium.de/sektion/s37/download/herschel_t2_e.pdf



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4.6. How to shorten the backfocus: Photographic and visual use of Astro T-2 part #27

Many manufacturers build refractor telescopes where the image plane is close to the focusser. If this distance is too short, many accessories can't be attached to the telescope.
In this case, the Astro-T2-adapter #28 is a very important accessory to shorten the length of the Herschel prism. If you remove the 2”-Clicklock, you can save 47mm of optical path and still use the 2”-ND-filter 0.3 and the 2”-Solar-Continuum-filter at the same place in the optical path.

Removing the Clicklock and attaching a DSLR with T2-part #27

Image 1: Remove the 2“-Clicklock by turning it counterclockwise. Use one finger to hold the 2“-filters tight, so that they don't rotate. Do not touch the filter surfaces!

Image 2: Unscrew the 2" threaded ring (#1508020) with the attached filters.

Image 3: Remember: The 2" threaded ring should be 5mm higher than the housing.

Image 4: Remove the 2"-filters from the 2" threaded ring.

Image 5: Screw the T2/2"-adapter ring #27 to the 2"-filters.

Image 6: Insert the Ring #27 with no more than two 2"-filters into the housing.

Image 7: The T2-adapter-ring is now mounted into the prism-housing.

Image 8: Mounting a video module with 1" C-mount-thread onto the Herschel prism using the Baader C-Mount/T2-adapter #2958520

Image 9: Herschel prism with attached video module. The orientation of the camera can be changed by loosening the screws at the side of the C-Mount-adapter.

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Image 10: Attach any standard T-ring (avaiable for all standard DSLR cameras) to the T2-adapter #27

Image 11: Cool Ceramic Safety Herschel prism with DSLR directly mounted onto the housing.

4.7. Attaching the Mark V binocular viewer

To use the Mark V binoviewer together with the Herschel prism you need a very big backfocus of ca. 210mm. Most modern telescopes have no more backfocus than 150-180mm. Usually you can't use this combination because you won't reach focus. You will need a glasspath corrector which increases the focal length of your telescope.

You can use the following table to see how much backfocus you need with which glasspath corrector.

Herschelprism with part # 27 and Giant Binocular Viewer	+ 1.25 Glaspathcorrector	+ 1.7 Glaspathcorrector	+ 2,6 Glaspathcorrector
210mm Backfocus	190mm Backfocus	175mm Backfocus	125mm Backfocus

Very few manufacturers provide the back-focus specifications for their scopes. Thus, the best way to determine your telescope's back-focus is to measure it yourself. To reduce the possibility of errors, it is best to measure the back-focus yourself.

The easiest way to measure back focus is to point your scope at the Moon (without eyepiece) and project its image onto a white card. The focuser should be fully retracted. Hold the card behind the empty focuser and find the position where the image of the Moon comes to sharp focus. This position is your telescope's focal plane. Measure the distance from the card to the end of the focuser. This is the amount of available back-focus for additional accessories - for example, a binoviewer plus eyepieces. Armed with this information, look at the table above. First, subtract the recommended 5-10mm to your back-focus value to allow for differences in eyepiece design and vision. Then, find the first column with a value less then your adjusted back-focus. The heading of this column indicates the appropriate Glasspath Compensator.

For example, let's say your telescope is measured to have 188mm of back-focus. After subtracting 10mm, your adjusted back-focus value is 178mm. The first column less than 178mm is 175mm, the column for the 1.7x Glasspath Compensator. The 2.6x compensator would also work, as it requires just 125mm of back-focus. You would decide between the two by considering the eyepieces you are planning to use, the focal length of your telescope and the desired magnification for your observations. Or, you could purchase both compensators and have two magnifications available with a single pair of eyepieces.

To connect the Mark V binoviewer directly at the herschel prism, you need the adapter #1508053 (item #27 in the Astro-T2-system) to convert the 2" female thread of the prism housing into a male T2-thread.This 2" male thread is hidden below the 2" Clicklock. You can unscrew it as shown in image 1 on page 13.

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Once the 2” Clicklock is removed, you’ll see a 2” threaded ring (2” conversion ring, image 2) which also holds the 2” ND 3.0 filter and the 2” Solar continuum filter. Unscrew these filters from the threaded rind and mount them in the 2”/T2-adapter #27. Now screw this adapter with the filters into the housing of the Herschel prism (cf. images 5-7 and 12). Finally, screw the T2 quickchanger (Zeiss-bayonet, #6) onto the T2-thread of the adapter #27 – as shown in image 13.

The glasspath correctors 1.25 and 1.7 are screwed without the black spacer ring directly into the quickchanger of the binoviewer. The 2.6 glasspath corrector is placed together with the black spacer ring inside of the T2 quickchanger which is attached to the prism, similar to image 15 (showing the Maxbright binoviewer). It is then hold in place by the binoviewer, once it is attached (image 14).

Image 12

Image 13

Image 14

4.8. Attaching the MaxBright binocular viewer

The MaxBright binoviewer has almost the same optical path as the Mark V. So you handle it almost in the same way as the Mark V above. The only difference is that you do not need the bayonet quickchanger #6. The MaxBright does not have a Zeiss Bayonet, but is already equipped with a rotatable T2-thread.

Image 15 shows how the T2-thread is connected to the T2-thread of the adapter #27.

All Baader glasspath correctors are placed in between prism and binoviewer. They are hold in place once the binoviewer is attached to the prism.

Image 15

4.9. Attaching an 1,25”-adapter

With the help of the 2”/T2-adapter #27 described above, you can also attach an 1,25”-eyepieceholder at the Herschel prism. The 1.25” Clicklock #245 8100 (part #8 of the Astro-T2-system) and the focussing eyepiece-holder #245 8125 (part #8A of the Astro-T2-system) both match the T2-thread.

#2458100 has a height of 32-38mm and #2458125 a height of 29-34mm. The original 2”-Clicklock has a height of 47mm, so you can save more than a centimeter, if you don’t need 2”-accessories. At the same time you do not have the disadvantages of a smaller 1,25”-prism which can’t be used with telescopes with long focal lengths or are more dangerous if the tracking of the mount doesn’t match the motion of the sun, so that the light may damage the inside of the focusser.

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To do so, mount the 2”/T2-adapter #27 with the filters as described in chapter XY (Image 17). Then, simply screw the 1.25”-adapter onto it (Image 18 shows the 1.25”-Clicklock #8). Now, you can use any 1.25”-accessories which have enough backfocus. If there is enough backfocus, you may even be able to use the Q-Turret quad eyepiece revolver, which needs ca. 4 cm backfocus (image 19).

Image 17

Image 18

Image 19

4.10. The FFC and the CCS Herschel prism

Warning: Be careful when using the FFC Fluorit Flatfield Converter to avoid damages and loss of warranty!

The FFC is probably the best projection optic for planetary photography using projection. It increases the magnification by factor 4-8. In combination with the Cool Ceramic Herschel prism you can achieve very high-resolution images of the sun’s surface.

But you must be very careful: The damageable lenses made of real fluorite crystals (No ED-glass) must not overheat! If a fluorit-lens breaks because of too much heat, this can be proven by professional examination, and this damage is not covered by warranty. Replacement of the fluorit lenses is very expensive.

To avoid overheating, a OD3 filter (or at least a OD0.9 filter, but in this case only for a very short time) must be mounted inside of the prism housing, in front of the FFC. When photographing the projected image of the sun, it is very tempting to remove all OD-filters from the prism housing, because with exposure times of ca. 3 ms you can freeze the air turbulences.

Unfortunately, this will result in a very fast heat shock for the FFC-crystals. All optical elements behind the Herschel (including your camera) will suffer under an enormous heat stress. Nevertheless, this kind of projection photography is becoming increasingly popular – and also possible because of modern mounts which can position very exactly and have fast slew rates of up to 20°/s. If you try this method, the telescope must not be pointed at the sun longer than 5 seconds, and we can give absolutely no warranty for the equipment behind the Herschel prism.

A working setup would look like image 20 on the right. But if you do not specialize in solar photography, we highly recommend that you never remove the 2”-filters used for visual observations from the CCS Herschel prism.

Image 20

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5. THE HERSCHEL-PRISM FOR EXPERTS Solar photography in the blue spectral region

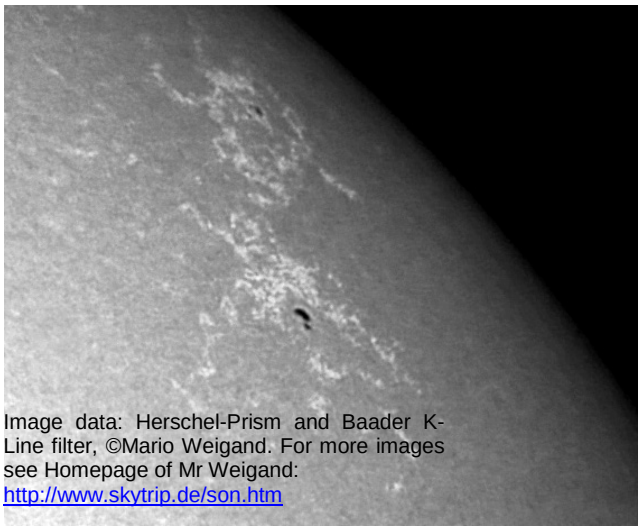


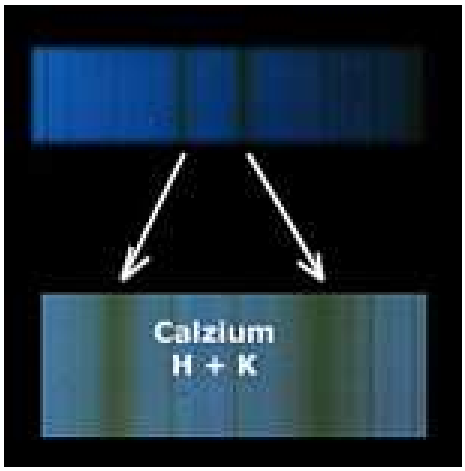
Image data: Herschel-Prism and Baader K-Line filter, ©Mario Weigand. For more images see Homepage of Mr Weigand: http://www.skytrip.de/son.htm

In the dark blue spectral range around 400nm photospheric faculae show up prominently in the vicinity of Sun spots everywhere on the Solar surface. When observing in integral light, these faculae regions are visibile only at the limb of the Sun. For observing in the spectral passband of 395nm the 1¼" Baader K-Line filter (#2458355) can be applied.

The two emission lines of Ca II, the single ionized Calcium at 397nm (H-line) and 393nm (K-line) are prominent in that wavelength. The half bandwidth (HBW) of the Baader K-Line filter measures 8nm.

Tips and Tricks:

The human eye is very insensitive (almost blind) in the spectral region below 420nm, therefore visual observation is **not** possible respectively not pleasing. The only appropriate sensors will be DSLR cameras, but even more successful will be webcams.



It is a miracle to us, why competitors offer "CaK"-telescopes for visual observation in that passband of the spectrum, while every sun-tan-studio is required by EU-law to warn customers not to look straigt into UV-A-radiation. Observing below 400nm is nothing else than looking into UV-A.

In order to make use of the high quality of the Baader K-Line filter in combination with a Herschel-Prism, the astronomical lens used for this purpose should be of apochromatic quality grade or be specially designed to deliver a color corrected image at 400nm. Most simple achromatic doublets are very badly color corrected so far in the blue wing of the spectrum so that images made with such optics will not supply pleasing results.

Now we would like to wish you all success and much pleasure observing our star, using the Baader Safety Herschel-Prism.

Your BAADER Team

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6. WEBLINKS

Should you be interested in further kinds of Solar observation after experiencing the virtues of the Baader Safety Herschel-Prism we recommend to evaluate using ultra-narrowband H-alpha filters made by SolarSpectrum. Please also see:
http://www.baader-planetarium.de/solarspectrum/sol_spec_start.htm

A detailed introduction into the history of Solar observation and various observation techniques is available at:
http://www.baader-planetarium.de/solarspectrum/funktion_halpha/index_halpha.htm

Sun and Solar observation in general:
http://www.baader-planetarium.de/zubehoer/zubsonne/sonne/index-sonne.htm

Current images of the Sun in integral light:
http://spaceweather.com

Current images of the Sun in different spectral regions taken by SOHO-spaceprobe:
http://sohowww.nascom.nasa.gov/data/realtime-images.html

Version of this manual: September 2012. We reserve the rights for changes of the manual if required.
Current version can be downloaded from:
http://www.baader-planetarium.de/sektion/s37/s37.htm

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