DAYSTAR FILTERS

0.7Å
0.5Å Hα Solar Telescope
0.3Å

60mm APERTURE, 1375mm FL
DAYSTAR PROFESSIONAL QUALITY
40°F TEMPERATURE RANGE
10 YEAR WARRANTY
MADE IN USA

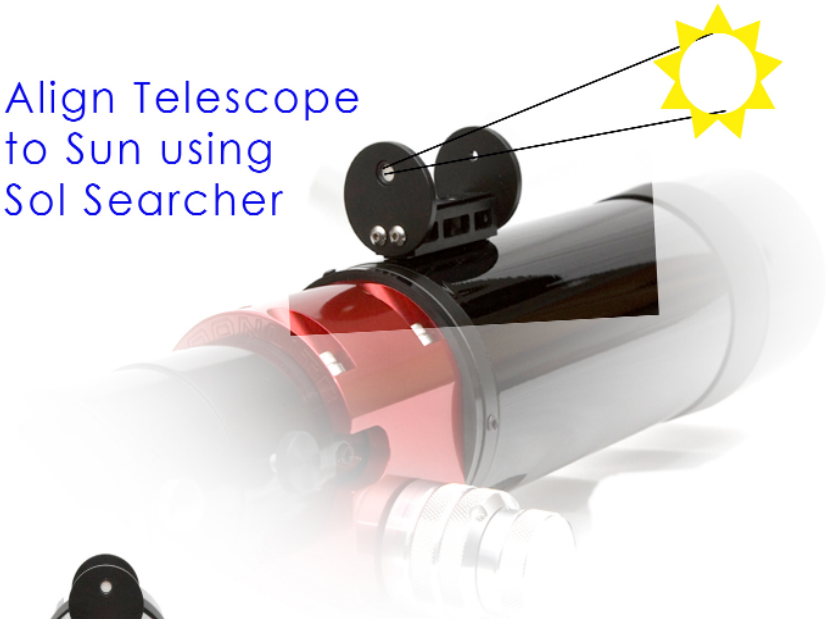
DAYSTAR FILTERS

ATTENTION!

DayStar SolaREDi telescopes are special instruments which may operate differently than even experienced telescope owners may expect.

For best results and safety reasons, please read instructions completely prior to using your DayStar SolaREDi Telescope.

1. Align Telescope to Sun using Sol Searcher



2. Look straight through the tube or diagonal with no eyepiece first to find and center the sun.

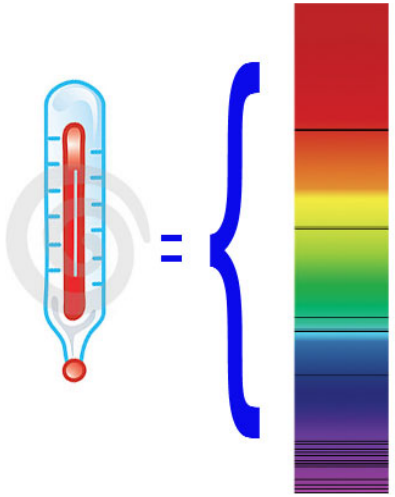
3. Then insert your eyepiece and re-center the image.

You may want to adjust the SolSearcher now.

DayStar Recommends 12-35mm Plossls, Radians and Panoptic eyepieces.

4

Dial out about 3" to achieve focus.
Use the fine speed knob for small adjustments.



Daystar Filters change wavelength with temperature!

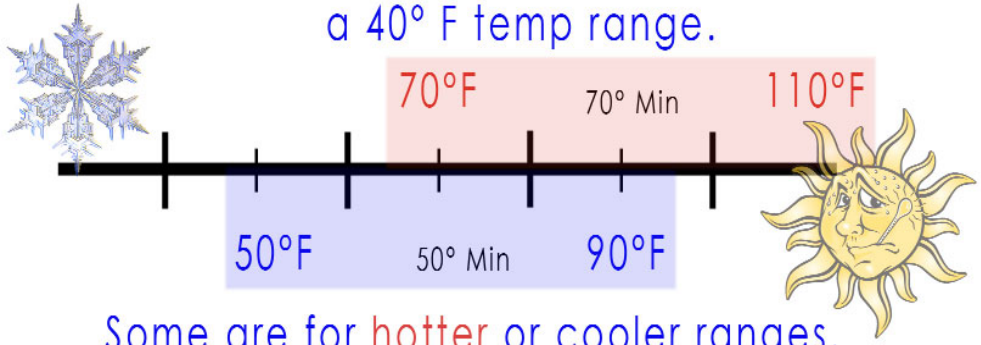
+17°F = +1.0Å

Your filter is tuned by tilt. If it is too cold, your filter will not operate on H alpha.

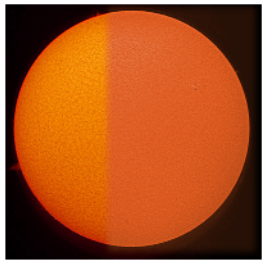
5

Adjust the RED TILT Dial
to tune the filter's wavelength.
In=Blue Wing
Out = Red Wing

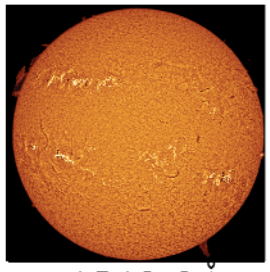
SolaREDi Telescopes have a 40° F temp range.



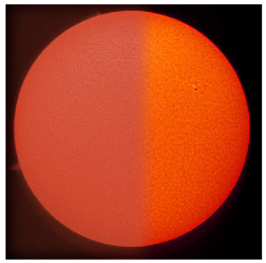
Some are for hotter or cooler ranges.



Blue Wing
Too Cold



6562.8Å



Red Wing
Too Warm

Use a dew heater to maintain minimum temperature when it is cold outside.

DAYSTAR FILTERS

SolaREDi α Telescope Operating Guide

Dedicated telescope for Hydrogen Alpha solar observing.
Wavelength: Hydrogen Alpha 6562.8 Å
Focal length 1375mm, F/23
Clear aperture: 60mm
Clear exit aperture: 32mm
2 element refractor.

Thank you for purchasing the DayStar Filters SolaREDi alpha telescope. This telescope has an 80mm F/4.0 doublet and a TeleVue 4X powermate to accomplish a focal length of 1375mm. It has a reduced clear aperture of 60mm in order to accomplish the F/23 necessary for proper operation. The diffraction limited resolution of this telescope at Hydrogen Alpha is approximately 2.8 arc seconds.

WARNING: POINTING TELESCOPES AT THE SUN CAN BE VERY DANGEROUS WITHOUT THE PROPER EQUIPMENT AND CONFIGURATION. NEVER POINT AN ORDINARY TELESCOPE AT THE SUN WITHOUT A SPECIAL, COMMERCIALLY MANUFACTURED SOLAR FILTER AFFIXED TO THE TELESCOPE. WHEN USING A DEDICATED SOLAR TELESCOPE SUCH AS THE SOLAREDi, REGULARLY CHECK THE TELESCOPE CONDITION TO BE SURE THAT NO PARTS HAVE BEEN ADJUSTED OR TAMPERED WITH IN A WAY THAT THE TELESCOPE COULD COME APART. WHEN FINDING THE SUN USING THE "Sol-Searcher", DO NOT LOOK THROUGH THE HOLE. MERELY OBSERVE THE POSITION OF THE DOT PROJECTED THROUGH THE HOLE ONTO THE VIEWING SCREEN. IF YOU SUSPECT THE SOLAREDi TELESCOPE MAY NOT BE FUNCTIONING OR ASSEMBLED PROPERLY, DO NOT ATTEMPT USE. ANY UNFILTERED LIGHT PASSING THROUGH A TELESCOPE CAN CAUSE INSTANT AND PERMANENT EYE DAMAGE.

KEEP THIS OPERATING GUIDE WITH THE SolaREDi AT ALL TIMES.

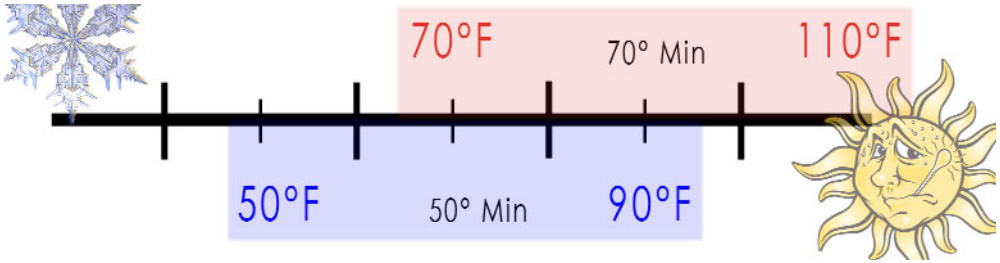
Standard features of the SolaREDi telescope include:
1375mm F/23 doublet telescope with
2" Moonlite crayford focuser with 4.5" drawtube with dual rate knob,
an internal 'visual hot mirror' reflective Energy rejection filter,
an internally configured TeleVue 4X Televue Powermate barlow lens,
a DayStar Filters sub-angstrom bandpass Hydrogen Alpha filter assembly
and TeleVue 'Sol-Searcher' solar finder.

Mounting: The SolaREDi combination mounting foot may be threaded directly to a ¼ x 20 standard camera tripod mount, or using industry standard "Vixen" style dovetail mounting accessories. With heavier 2" eyepieces or equipment, we discourage camera foot mounting. Users may consider a tracking mount for best results. The included Moonlite focuser may be rotated with adjustments to the allen screws found in front of the red focuser section.

Focus considerations: We designed the SolaREDi with a wide variety of focus options and focus range. In conjunction with the 4X powermate, the actual focus travel is magnified by 5 times. Therefore, only minor movements in focus on the knob are required to accomplish large changes visually. Most eyepieces and cameras focus with the tube extended approximately 2.5- 3" out.

Tune for Hydrogen Alpha: Temperature affects the tuning of your SolaREDi alpha telescope. Your SolaREDi telescope has a minimum operative temperature range printed on the attached label. When the SolaREDi is cold, shorter wavelengths are allowed to pass through. When it is warmer, longer wavelengths are allowed to pass through. To accommodate a 40°F (22°C) climate range, the SolaREDi can tune its wavelength to pass Hydrogen Alpha light.
To tune your SolaREDi, slowly twist the red tilt adjustment screw (located on the side of the drawtube barrel) while looking through the eyepiece. You should notice a change in surface texture on the disk of the Sun as the filter tunes on and off of the Hydrogen Alpha wavelength. You will want to tune to a position which offers best surface contrast across the entire disk. This position will offer your best view of prominences, spicule and surface detail.

Operating temperature: The SolaREDi is operable on-band in a temperature range of approximately 40°F. In climate conditions below the minimum operating temperature of the SolaREDi, the filter will not operate on-band. A heating strip can be applied at the barrel section containing the black screw. This will allow users to increase the operative temperature range of the instrument. DayStar filters recommends the Kendrick Astro Systems product line, in particular, the Kendrick Firelite heater is a compact, inexpensive and effective accessory.



The SolaREDi telescope assembly may also change temperature and require settling time when first removed from its storage and placed into use.
Also, during the day, as the temperature of your SolaREDi telescope increases, you may need to adjust the tuning action in order to stay at 6562.8Å.

Tuning / Tilting action: The optical filter assembly stack is located in the eyepiece barrel before the eye piece. It is mounted on pivot points which allow the assembly to tilt. The red headed thumbscrew on the side of this barrel will cause the optical assembly to tilt, and change the wavelength of light exiting the filter. Your optical image will not move or need re-focusing with this tilt.

Filtration and safety: The optical solar filter stack is mounted at the rear, eyepiece end of the SolaREDi alpha telescope. Alone, it provides off-band rejection density greater than 6.0 from X-ray to beyond 2 microns. This means that it is safe to look directly into the rear of a properly assembled SolaREDi alpha telescope without an eyepiece. The SolaREDi alpha telescope requires no additional blocking filters or special diagonals or eyepieces and unless it is disassembled with tools, the telescope cannot be rendered unsafe. Should any element of the filter age or degrade, that degradation would cause a darkening of the image and not an unsafe filtration.

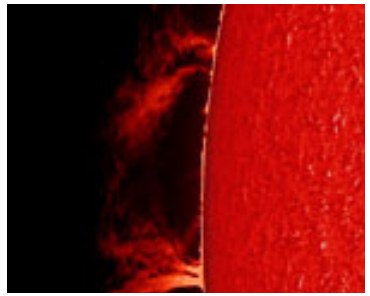
A word about daytime seeing and limiting resolution:
During the daytime, radiant heating from the sun affects seeing significantly. Characterized by turbulence or shimmering as seen over a hot street, seeing can cause significant impact on quality of solar observations.
Bad seeing is caused by air of different temperatures mixing. This typically happens within the lowest 10 feet of air. It occurs most often over pavement, dark objects, rooftops and sometimes trees.

High cirrus clouds or "scuz" will cause scattering of sunlight in the high atmosphere which often makes for bad viewing conditions. A classic sign of high cirrus clouds is the inability to achieve focus, or the need to "chase focus". A jet-stream moving overhead can also hurt seeing conditions even on a clear day.

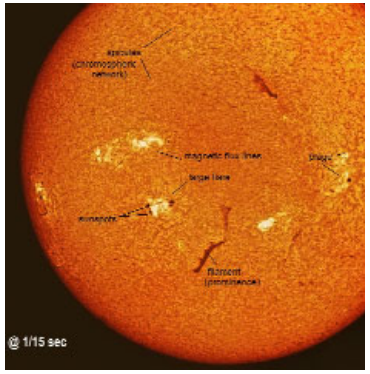
While many of these conditions are beyond our control, observing in an area with ideal conditions without pavement in the direction of viewing and on days with no high cirrus will offer best results. Grass is the best environment for daytime seeing stability.

The SolaREDi 60mm has a limiting resolution at 6562.8 of approximately 2.8 arc seconds. Over-magnification of the image will have resolution limitations in which features can not be resolved. Also note that the sun's limb in hydrogen alpha is soft, with a fuzzy layer of chromosphere surrounding the surface. Using eyepieces higher than 12mm in power, it is challenging to achieve focus on the limb. For users who are interested in higher magnification, we suggest one of our other models of T-Scanner or Quantum DayStar filters which can mount to your existing telescope and be used up to 6.5" in clear aperture.

Bandpass Expectations:



0.7Å users will find that prominences are easily visible and very well-pronounced with a 0.7Å filter. Surface structure is not very contrasted, but it is possible to see mottling on the surface and large flares, plages and active regions.

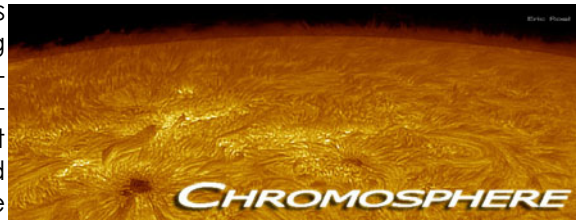


0.5Å users will see prominences but not quite as broad as with a 0.7Å due to wing shift in the prominence. Surface detail will be much stronger with a 0.5Å, revealing more detail in active regions, filaments, spicule, and all other features.

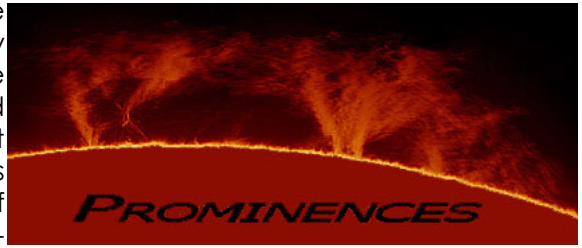
0.3Å users will see only very thin, hairline prominences, but surface contrast will be very defined and sharp. Soft chromosphere will appear in highest detail with .3Å.

Features of the Sun in Hydrogen Alpha

By observing the sun with a narrow bandpass filter tuned to 6562.8Å, we can observe the behavior of the Sun's **Chromosphere**. The chromosphere is like a shell of gas around the Sun's photosphere, always moving and changing. The chromosphere's structure behaves differently in active regions than quiet areas, where magnetic field lines are stronger. Thought to be tied to the photosphere, the chromosphere is governed by magnetic forces and, yet it still has its own IntraNetwork (IN) of material oscillating every 5 minutes.

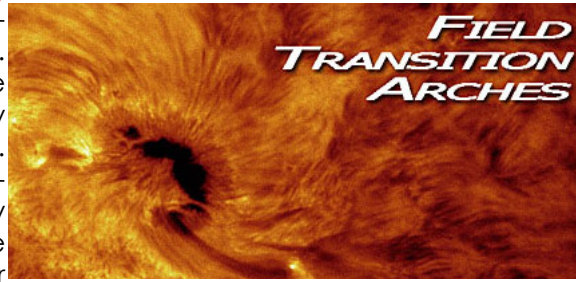


On the limb, even a rather wide filter of 1Å or more will show **prominences**, a detail of the chromosphere projected against the dark black contrast of space. To observe the details of chromosphere on the face of the sun, we need a narrower filter to eliminate more off-band light of the photosphere and continuum. We need a filter less than 1.0Å. The narrower the filter's bandpass, the more contrast we will see - down to 0.4Å, where prominence structure is reduced due to high velocity and subsequent wing shift.



Spicules dominate the chromosphere in non-active regions and have been studied exhaustively. They are barely visible, last only about 15 minutes, and resemble a "burning prarie". Some jets can be seen shooting 10,000 km up from the Sun's limb at velocities of about 30km/sec. Studied exhaustively, they present a number of observing challenges, as they are too small to resolve and move so quickly as to present wing-shift challenges.

Field Transition Arches (FTA's) connect P and F spots - elements of opposite polarity. Inside an active region, where sunspots are originally linked by a FTA, a shear boundary forms. Field Transition Arches are different from filaments in that they are thin and not very dark. The FTA usually has plage or granular structure underneath.

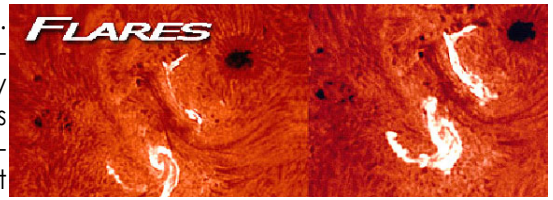


Filaments appear as large, dark eyebrows across the surface of the Sun. With a brightness of about 10% of the disk due to scattering, they appear dark on the surface, but on the limb, show as a prominence. Active Region Filaments (ARF) differ from Quiescent Region Filaments (QRF). ARF are darker, smaller and have more coherent fibril structure along their axis. A sheared magnetic field runs parallel to this axis, permitting a sizeable flare. QRF may produce a big Coronal Mass Ejection (CME). An ARF may erupt and reform several times.

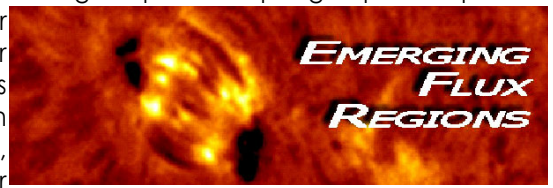
Plages: Most of the active region area is occupied by plage. Considerable atmospheric heating takes place in the plage. It is bright in everything from Halpha to the Calcium H and K lines. This heating is thought to account for an absence of spicule. While absent over plage, spicule are prominent around its edges.

Elerman Bomb: A remarkable feature of Emerging Flux Regions is the Ellerman bomb. Bright points with very broad H-alpha wings (±5Å) that are low in the atmosphere so they are not visible on H alpha centerline. Called 'moustaches' for their appearance on spectrograph, they appear spectroscopically like wide moustaches with a gap in the middle. This strange and tiny feature typically occurs at the center of the EFR or in the edges of spots - where the field is breaking the surface.

Solar Flares are intense, abrupt releases of energy which occur in areas where the magnetic field is changing by flux emergence or sunspot motion. Stresses in lines of force build up slowly and are released in flares. They occur most frequently at neutral lines where a filament is supported by horizontal sheared field lines. This event can only take place along a magnetic inversion line. When many lines of force are involved, two ribbons of emission appear, brightening simultaneously.



Emerging Flux Regions: An area on the Sun where a magnetic dipole, or "flux tube" is surfacing on the disk, eventually producing a bipolar sunspot group. Each pole of an EFR is often marked by pores or small developing sunspots. Surges or even small solar flares can sometimes occur in EFRs. An EFR emerges with small bright H region with little surges, then weak arch filaments (AFS) over bright plage connect small spots on each dipole. Growth is rapid, forming in just a few hours.



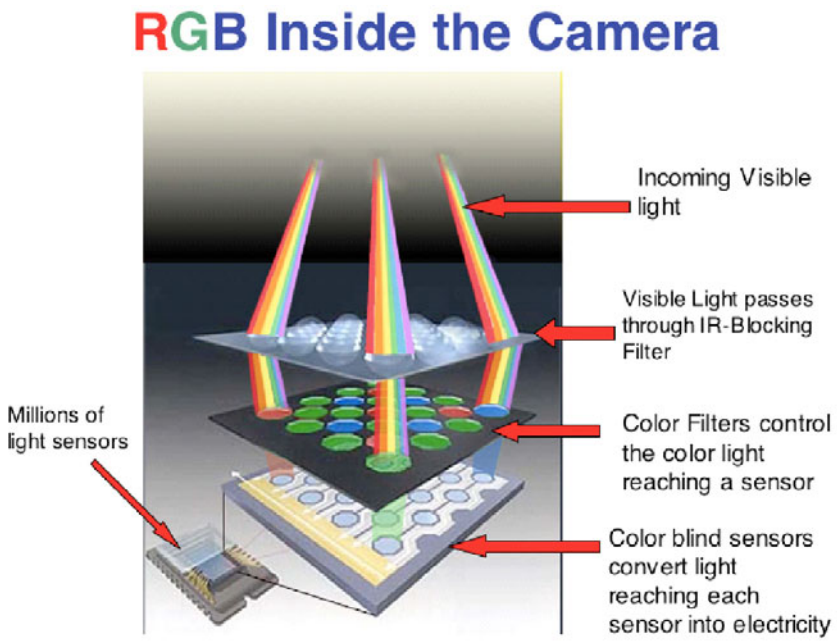
- SLR, DSLR, CCD and webcam cameras may be mounted in the 2" focuser using a standard 2" to T-Thread camera adapter and appropriate T-ring to camera adapter. 35mm film cameras or most DSLR's will show full disk. Monochrome cameras are preferred over color models, for their greater resolution and sensitivity at H-alpha.

We recommend the Moonglow Technologies Interference Eliminator with DSLR cameras to eliminate 'Newtons Ring' interference patterns.

- Bino-Viewers can be used with the SolaREDi telescope. Barlows or negative lenses are not necessary, as the focus travel of the telescope has already been increased by the application of a TeleVue powermate.

- DayStar recommends 12-30mm Radians, Plossl's and Panoptic eyepieces.

Note about digital imaging: Hydrogen Alpha is a very narrow or monochromatic wavelength of light. Many cameras which use a color CCD chip have sensors for blue, green and red. The pixel sensors which are sensitive to blue and green have no data in Halpha, so a color CCD chip will give 1/4 of the resolution that a monochrome chip of the same size does. Also be aware that image processing algorithms often average pixels, which reduces image quality in addition to reduced resolution. While color CCD imaging such as DSLR is convenient and accessible to the public, it includes a number of unavoidable inherent limitations.



Daystar recommends MONOCHROME CCD imaging whenever possible for best results.

The recent availability of CCD cameras and DSLR cameras has offered a simple opportunity for solar observers to image the Sun in Hydrogen Alpha with a Digital SLR camera. Please be advised, however, that due to the nature of monochromatic light and its effects on a CCD camera, certain effects usually occur.

The DSLR imager must be aware that most camera manufacturers (Canon and Nikon) use an IR blocking filter which greatly reduces the transmission of Hydrogen Alpha light. DSLR cameras without this IR blocking filter will have better sensitivity imaging in Hydrogen Alpha.

The imager should also appreciate that the COLOR CCD chip is constructed in a way that only 1:4 sensors detect red light. The other 3 sensors only detect blue and green. So a color CCD chip (in a DSLR or a CCD camera) will only offer 1/4 the sensitivity and 1/2 the resolution of a monochrome chip.

R	G
G	B

Another effect present in CCD imaging of monochrome light is the interference pattern - or Newton's Rings. The effect is similar to interference testing of an optical surface between two flat surfaces. The sensor and cover slip cause a small interferometer inside the camera and cause a Newton's Ring moire' pattern. The CCD chip must be tilted to a minor degree to prevent this pattern. Recent advances in aftermarket adapters offer a simplified solution for the issue. This effect is a concern for both color and monochrome sensors. An optional accessory is available from DayStar (MG-0408) which can be used between the DSLR and SolaREDi to adjust the light angle and extinct the interference pattern.

Fortunately, short exposures mean imagers can sort from hundreds of frames over a span of time to select from superior seeing cells which occur regularly. High speed imaging and sorting from hundreds of frames greatly reduces the need for stacking.

o The Best Digital imaging success in Hydrogen Alpha comes with a MONOCHROME SENSOR.

o Digital imagers should consider a way to tilt their chip through adapters or configuration.

o Digital imagers should consider high speed imaging to image-sort for superior seeing cells.

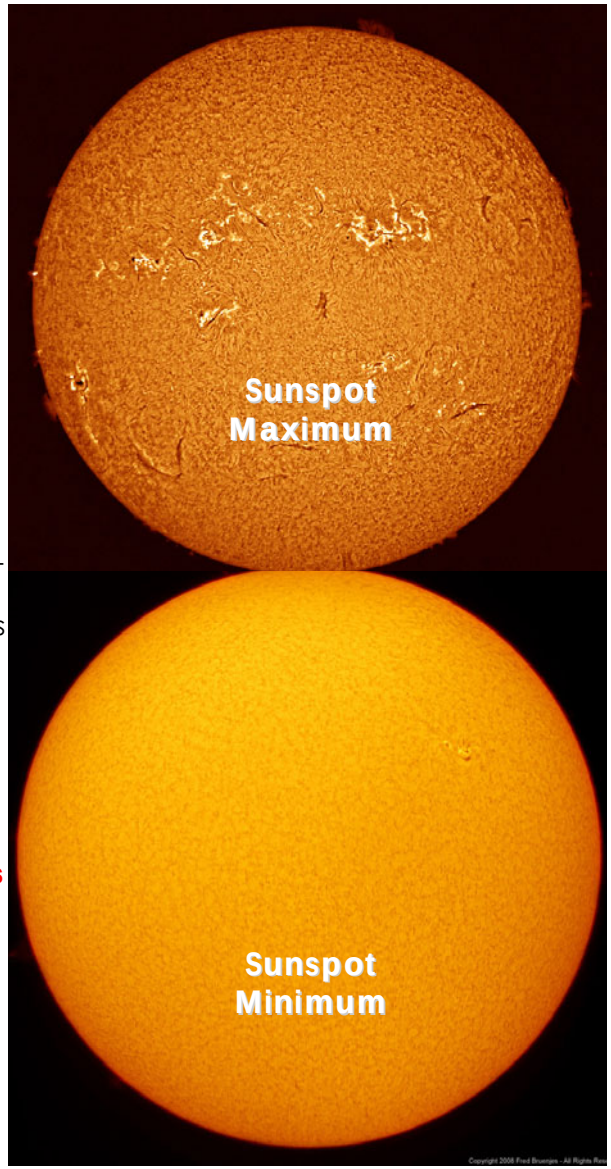
Daystar recommends MONOCHROME CCD and high speed imaging cameras with image-sort technique to overcome seeing limitations. When Newtons' rings are present, we recommend the MG-0408

Solar Minimum Notice:

Let us remember that the Sun has a sunspot minimum and maximum cycle of about 11 years. We are currently experiencing a period of sunspot minmum that has lasted surprisingly long. This means that the sun may not have as many exciting things going on the day that you view or image, than you may have seen in photos or in the past, if during a point of higher activity in the past.

This difference in visible activity is unrelated to the instrument through which the sun is viewed.

Prominences and active regions will return as they always have before.



DayStar Telescopes and filters are all HAND MADE.

- Each instrument is hand manufactured and assembled one-by-one. Each is unique. Slight variations in construction that do not affect performance may occur.
- Each instrument is indivudually tested on the Sun. Sun testing is an absolute necessity to assure quality performance. While every precaution is taken to maintain the 'like new' appearance of the telescope, it may encounter minor cosmetic smudges or abrasions on the mounting foot or the drawtube during testing.
- The optical filter stack is assembled by human hands using special optical couplant that must remain loose for over 10 years. Occasionally, if disturbed, this couplant can migrate to optical surfaces. Do not disturb your optical stack. If a small amount of couplant is smudged onto your outer surfaces, it is best not to disturb it. It will not affect performance, like a large mirror. Larger smears will need to be cleaned by technicians at our factory.

Care and cleaning: While not in use, we recommend that users store the SolaREDi alpha telescope with its end caps on, in the provided heavy duty re-sealable plastic bag with dessicant dehydrating packets; in a climate controlled environment. The SolaREDi telescope optical filter life expectancy is extended up to 2-3 times by climate controlled storage.

Do not touch the internal, red optical elements of the SolaREDi filter assembly. While the exterior glass surface coatings are durable, they are easily scratched. A few specks of dust will have no effect on the quality of the image, and may be gently blown off with a squeeze bulb. Do NOT use compressed air cans to blow dust off any optical surfaces. Small amounts of residual 'film' will not affect visual performance. Fingerprints, smudges and smears must be cleaned off. Preferred cleaning method is to return the SolaREDi to the DayStar Filters laboratory for proper factory cleaning. Do not unscrew, open or separate your SolaREDi filter assembly. The optical elements are held under pressure by design and will become damaged if opened. Opening the optical filter assembly will void your warranty. The safest cleaning method is to moisten a very soft, lint-free tissue, cloth or "Q-tip" with a pure acetone, methanol, or Isopropyl Alcohol (reagent grade) and gently whisk away the stain. Do not apply solutions directly to the glass surface. Stroke from the center of the aperture outward only. After each cleaning stroke, use a fresh applicator. The fewer strokes, the better!

The tube and other parts are powder-coated for durability and can be polished with any non-abrasive car wax. Red anodized surfaces can be cleaned with Windex.

Warranty: The SolaREDi alpha telescope is warranted to be free of manufacturing or workmanship defects for 10 years from the date of purchase. If your SolaREDi alpha telescope requires warranty service, please contact DayStar Filters to discuss the defect, upon which you will receive a return authorization. NO RETURNS ARE ACCEPTED WITHOUT PRIOR AUTHORIZATION.

The warranty does NOT include: collimation, defects caused by mis-handling, excessive or inappropriate weather exposure, optical cleaning, or opening the optical filter assembly, defects of a subjective nature, coverage for any telescope purchased through an unauthorized DayStar Filters dealer.

Warranty work will be performed at DayStar Filter's discretion and may only be performed at the DayStar Filters laboratory. The telescope must be shipped in its case with proper inner and outer packaging. Return shipping and insurance charges are the purchaser's responsibility.

Special note about opening the filter compartment:
Sadly, about 1 out of 10 filters returned for service at DayStar have been opened by the owner in an attempt to repair the filter themselves. These opened filters are always damaged by the act of opening the optical compartment, requiring more expensive repair services than if the unit was left intact.

Other DayStar Products:

T-Scanner H-alpha Filter:
- Introduced in 1988, the T-scanner is a non-heated, tilt to tune filter which is applied at the rear of any telescope of any aperture operating at F/30. Requires a front mounted Energy Rejection Filter (available in sizes up to 165mm). T-scanner is not heated and operates at ambient temperatures with a 40° F climate range. Best in coastal or temperate climates.

Quantum H-alpha Filter:
- Introduced in 1973, with housing improved in 2007, the Quantum is a heat-controlled precision tuned filter which is applied at the rear of any telescope of any aperture operating at F/30. Requires a front mounted Energy Rejection Filter (available in sizes up to 165mm). Quantum filters' tuning is controlled to 0.1Å accuracy and may be tuned up to 1.0Å in red and blue wing. Operates on 12VDC. Includes LCD readout and wing-shift button controls, serial interface port for remote operation, international power supply and 6 foot extension cord.

Energy Rejection Filter:
Mounted on the front of the telescope before the objective, a red or yellow colored glass Energy Rejection Filter (ERF) is designed to absorb excess UV light before entering the telescope system. Note that colored ERF glass cannot be used in conjunction with Calcium line filters. ERF glass is available in sizes from 50mm up to 165mm.

Calcium II K and H Line Filters:
Calcium II line filters are aimed at one of two important emission lines of Calcium at either 3933Å or 3969Å. The Ca II H-Line filter is designed for visual use. At 5.0Å wide, and higher into the visual spectrum, it offers a brighter and easier image to see. It is offered in a Tilt-tune housing like the T-scanner, as tuning isn't as critical due to the wide emission line. The Ca II K-Line 2.0Å filters are for professional applications intended for observations of the sun's atmosphere. It is offered in the Quantum style housing in order to precisely target subordinate lines inside the main K line.

For information about other DayStar products, contact your local dealer or visit: www.DayStarFilters.com

Welcome to DayStar Ownership:

Always remember:
Use caution when solar observing. Inspect your instrument regularly and do not leave it unattended in a crowd.

DayStar etalons are Temperature Sensitive.
DayStar filter optics are rear-mounted.
DayStar filter optics are designed to tilt for tuning.
DayStar filter optics have operative temperature ranges.
DayStar SolaREDi telescopes have LONG focal ratios.
Fast eyepeices such as Nagler are not recommended.
Your image will be large. Use a wide eyepiece.
A robust mount is recommended.
A DayStar filter is a solid spaced, not an air-spaced etalon.
A DayStar filter does not use 'double-stacking' techniques.

DayStar products are all hand-manufactured in the USA.
A DayStar Telescope is warranted for 10 years.
A DayStar product can be traded-in or upgraded.

Clear Skies, and remember:

No Sun, No Fun!

Jen Winter - Owner

DAYSTAR FILTERS

www.DayStarFilters.com
149 Northwest OO Highway • Warrensburg, MO 64093 USA
866-680-6563