

# Prestige H-alpha solar filter systems manufactured in the Isle of Man



**Company Seven**

ASTRO-OPTICS DIVISION  
MONTPELIER, MD 20709-2587  
301-953-2000 • WWW.COMPANY7.COM

Solarscope was founded by Ken Huggett in 2002 to manufacture high quality H-alpha solar instruments. The company is situated in the Isle of Man, at the Technical Optics factory, which was purpose built to produce quality high energy laser optics and Fabry-Perot etalon optical substrates.

Laser optics and Fabry-Perot etalon filter based instrumentation have been manufactured at the Technical Optics factory since 1977. The Isle of Man has gained worldwide recognition as a centre of excellence for Laser optics and for the manufacture of high quality planar fixed air space, solid and tuneable Fabry-Perot etalon instrumentation. The optical and mechanical components are produced by very highly skilled opticians and engineers, many with decades experience in development and production of optics and Fabry-Perot etalon instrumentation.



Etalon manufacture places extreme demands on a company's optical and coating abilities. Material purity, optical figure, plate parallelism, surface, spacer and coating quality are all critical to the overall performance of an etalon. The very high tolerances of surface figure and transmission measurements require use of non contact interferometry with specialised analysis software.

Incident light will only be transmitted at a required wavelength through an etalon when the parallel air space between the partially reflective coatings is exactly equal to whole number multiples of half the wavelength of the incident light.

In telescopic astronomy, optical filters are often useful for observing objects at specific wavelengths. A major advantage of using etalons as optical filters is their very high throughput at peak resonance and very narrow spectral transmission.

Compared with other filters, Fabry-Perot etalons are powerful devices. Their characteristics open up a wide range of applications for spectral analysis where high stability and performance are required for industrial and scientific research, high resolution spectroscopy, astronomy, aerospace and communications.



The basis of the Solarscope etalon is a matched pair of ultra fine pitch polished, accurately figured  $\lambda/100$  fused silica plates, with partially reflective, low absorption coatings for 656.28nm on the front faces and anti-reflector coatings on the back faces. The etalon assembly has optically contacted spacer pieces of very precise thickness, uniformly arranged around the etalon plate periphery to provide maximum rigidity and stability for the air gap.

The etalon spacers are cut from low thermal expansion material, polished and figured to high levels of surface flatness and parallelism. When the etalon construction and optical contacting procedure is complete, the tuned etalon assembly is resiliently mounted into a cell designed to afford shock protection and freedom from stress.

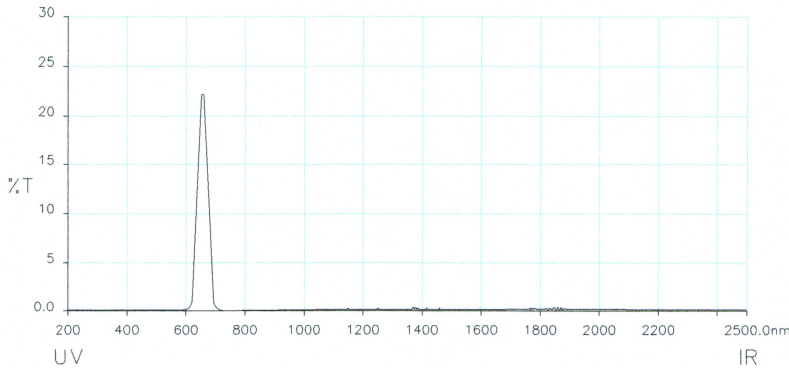
Solarscope dedicated solar telescope and filter systems feature the only conventional ultra narrow bandwidth Fabry-Perot etalon available to the astronomy community with a full and completely unobstructed aperture. This distinct feature contributes to an image with the highest possible contrast, resolution and definition for both visual and photographic purposes.

The Solarscope etalon and full aperture solar filter is only made possible by using the very high optical fabrication skills, time, patience and great care that is normally associated with the manufacture of high quality Fabry-Perot etalons. Solarscope filter systems are available in 50, 60, 70 and 100mm aperture.



**Safety is paramount:** Positioned at the front of Solarscope H-alpha solar filters is the energy rejection filter (ERF) used with other optical blocking elements to suppress ultra violet, infra red wavelengths and to control brightness of final image. Combined blocking effect of these elements in the UV and IR are shown in the Perkin Elmer Lambda 900 spectrophotometer transmission plot below. The transmission peak at 600 - 700nm is within the visible spectrum containing the H-alpha spectral line at 656.28nm.

Final suppression of unwanted light and transmission of a single narrow H-alpha spectral line is achieved by the addition of a Fabry-Perot etalon and secondary blocking filter combination. This is an ultra narrow line width 0.7



angstrom bandpass filter, consisting of a precisely tuned, air space Fabry-Perot etalon, used in series with a secondary multi-cavity interference blocking filter. The secondary blocking filter blocks all transmission peaks of the Fabry-Perot etalon, except for a single ultra narrow spectral line centered at 656.28nm, the H-alpha wavelength. The transmission characteristics of the etalon, secondary blocking filter combination are too narrow to be resolved and shown meaningfully on the transmission plot.

**Specifications:**

Solarview 50 / 60  
Focal Length  
Focal Ratio  
Objective Lens  
Full Aperture  
Operating Wavelength  
Etalon Coating  
Anti Reflector Coating  
Transmission  
Thermal Stability  
Eyepiece Tube ID  
Length  
Weight

**Solarview 50 / 60mm aperture dedicated telescope**

SV-50	SV-60
400mm	480mm
f / 8	f / 8
Achromatic	Achromatic
50mm	60mm
656.28nm ( H-alpha )	
Ultra Hard multi-layer dielectric	
Ultra Hard multi-layer dielectric AR	
0.7Å Bandwidth with fine-tune facility	
<1 Å / 200°C	
1-1/4" / 31.8mm	
355mm / 14"	382mm / 19"
1.5 kilos / 3.5 lbs	2.25 kilos / 5 lbs



Solarview SV-50 and SV-60

**Specifications:**

Single Filter  
Double stacked Filter  
Full Aperture  
Operating Wavelength  
Etalon Coating  
AR Coating  
Single Filter Bandwidth  
Double Filter Bandwidth  
Thermal Stability

**Solar Filter - 50, 60, 70 or 100mm aperture**

SF-50	SF-60	SF-70	SF-100
DSF-50	DSF-60	DSF-70	DSF-100
50mm	60mm	70mm	100mm
656.28nm ( H-alpha )			
Ultra Hard multi-layer dielectric reflector			
Ultra Hard multi-layer dielectric anti reflector			
0.7Å with fine-tune tilt adjustment			
0.5Å with dual fine-tune tilt adjustment			
<1 Å / 200°C			



DSF-70, DSF-60 and DSF-50  
Double stacked units

Solarscope solar filter systems enable standard night-time telescopes to be adapted for completely safe H-alpha solar observation. The solar filter screws into an adapter plate that is either screwed or mounts onto the front of the user's telescope. The secondary interference blocking filter assembly is mounted into the telescope focuser draw tube, a star diagonal and eyepiece is added to complete the system.

Standard Blocking Filter Assembly

**Solar Filter - Secondary Blocking Filter unit**

Ideal for use with 2" accessories, the unit has a 2" tube mounting facility, 20mm or 30mm aperture secondary blocking filter and related optics mounted in a pre-set tilt cells. Supplied with 2" to 1-1/4" reducing adapter

For telescopes with 1-1/4" tube facility

1-1/4" right angled star diagonal assembly, 15mm aperture secondary blocking filter and related optics mounted in pre-set tilt cells



Standard 20mm Blocking Filter unit

**Adapter plates - available for a wide range of refractor telescopes**

Solarscope solar filter systems can be used on most telescopes of 3,000mm focal length or less, a good quality refractor is advised. Screw on or slip over type adapter plates can be supplied for many different makes of telescope upon request.





Solarscope manufacture ultra narrow bandwidth 0.7Å Fabry-Perot air spaced etalons, precisely tuned at 656.28nm the H-alpha line, an important emission line for solar observation as the Sun's surface layer contains a high proportion of Hydrogen. Solarscope H-alpha filters will show you the complete range of solar features visible in this fascinating light, including prominences, spicules, dark mottles, filaments, active regions, sun spots and more.

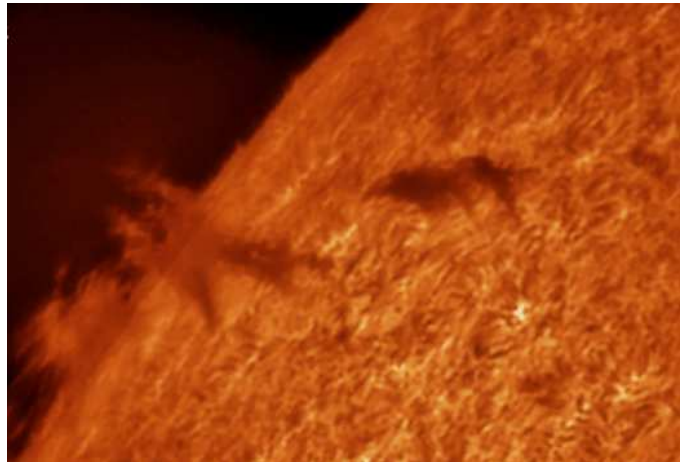
The unique Solarscope internal tilt mechanism allows the etalon cell adjustment within the front filter unit whilst observing in order to fine tune and optimise the ultra narrow filter 0.7Å bandpass. The etalon can be tilted by using the adjustment screw on the filter body. When flares and coronal mass ejections occur, they can sometimes travel with such high velocity towards the observer that their wavelength is Doppler shifted down spectrum. Use of the etalon tilt facility also enables observation of these events.



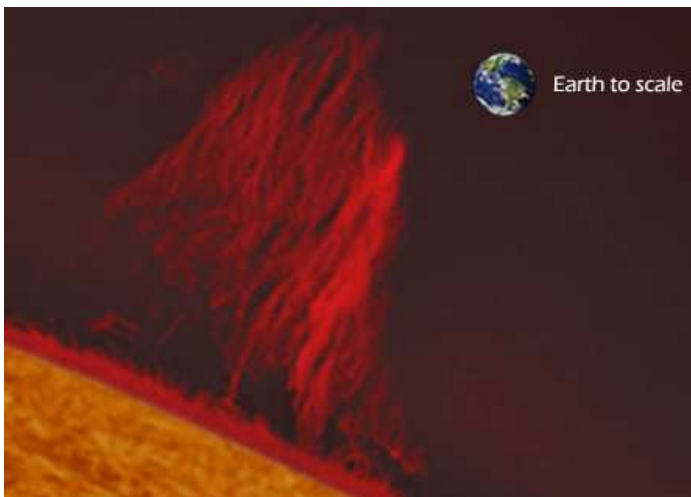
SF-50 image courtesy of Gene Turner, Arizona Sky Village

Solarscope double stacked solar filter systems provide an advantage for the observer interested in studying both prominence and enhanced image contrast and surface detail. Whilst double stacked 0.5Å bandpass filters do dramatically increase image contrast, prominence details can be slightly less defined and dimmer due to the narrower bandpass transmission.

For optimum views of prominences, Solarscope systems allow the front filter unit to be removed from the second etalon unit and used as a 0.7Å bandpass single filter. This unique facility enables use of either the single filter or the 0.5Å double stacked system as many experienced imagers prefer to use the 0.7Å bandpass single filter unit for selective photographic purposes.



Double stacked DSF-70 image courtesy of Pete Lawrence, UK



Quality control of Solarscope mechanical and optical components is kept to a high standard. Optic figure, polished flatness and parallelism are maintained during the many procedures of optical fabrication. Finished optics are Ultra hard dielectric coated at required wavelength. Optical spacers are then polished tuned for the etalon assembly optical contacting procedure.

Completed Solarscope dedicated telescopes and solar filter systems are solar tested in good viewing conditions. The image resolution and performance of each telescope or filter system is optimised before final preparation and packaging for shipment.

SF-100 image courtesy of Pete Lawrence, UK



## Safety advice and user instructions

**Please read safety advice and user instructions carefully** It is imperative Solar telescopes or Solar Filter systems are always handled and used with great care. Avoid any knocks and do not drop the instrument as such impacts could separate the etalon plate optical contacts or damage optical components.

**Warning** Do not look directly at the sun. **Under no circumstances** attempt to align any telescope with the sun before the adapter plate, front Solar Filter unit and rear Blocking Filter assembly are correctly fitted. Once fitted, the fully converted telescope is totally safe for solar observation and ready for alignment with sun. Safest way to align a Solarview-50 or 60 with the sun is to use the Tele Vue Sol Searcher pinhole projection unit provided, mounted into machined slot on Solarview body. A safe method often used with converted solar telescopes, is to stand beside the front of telescope and minimise the front filter unit shadow projected onto adapter plate.

**Warning** If the Solarview telescope or Solar Filter telescope system is used in conjunction with another finder or guide telescope, it is imperative that all optics of such other optical instruments are covered by protective lens caps to prevent sunlight entering the finder or guide telescope in order to avoid accidental viewing.

**Warning** Avoid accidental viewing. **Under no circumstances** remove front solar filter unit while telescope is in use and aligned with sun. The focused image may cause irreversible eye damage, skin burn or damage the blocking filter.



**Do not attempt** to screw front filter unit onto Solarview body or unscrew using only one hand. **Always use both hands** One underneath the filter unit as support, use other hand to screw front filter unit on and off Solarview body. Do not over tighten front filter unit. Replace protective caps to filter unit when removed from the telescope body and store filter unit in the carrying case for protection. Mount star diagonal into the telescope focuser 1-1/4" tube, then eyepiece.

Align the Solarview or fully converted solar telescope with sun and focus image. With full solar disc or a feature of special interest, such as a prominence located in the centre of the field of view, the image resolution can then be optimised by fine tuning and focus. The knurled adjustment screw on the solar filter body allows the etalon assembly a small degree of tilt. **Fine tune tilt adjustment should only be made** while actually observing the solar disc. Changes to surface detail and image resolution will be immediately apparent. The secondary multi-cavity interference blocking filter at telescope focus end is preset during the solar test at the factory and does not require further adjustment. For 50, 60, 70 and 100mm aperture 0.7Å single solar filter systems use above viewing procedure.

When setting up a **0.5Å double stacked** system. **Do not** begin by attaching the two filter units together, it is important to only mount the single front 0.7Å single filter unit and optimise view. When satisfied with view, take care **Not to disturb** the adjusted front filter unit tilt screw. **Now it is imperative to misalign** the telescope away from the sun before removing the front filter unit from the adapter plate, in order to screw the two filter units together. Carefully attach front filter unit to second filter unit. **Always use both hands** to remount the combined filter units onto the adapter plate. With telescope realigned with sun, adjust only the (black anodised) filter unit tilt screw to optimise view. When finally optimising bandpass and solar image with 0.5Å double stacked filter systems, both etalon fine tilt adjustment screws may be used and also to remove any etalon back reflection images from field of view. Setting up double filter unit becomes routine, when familiar with the appropriate adjustment screw positions.

When using double stacked 0.5Å bandpass systems. The black anodised cased filter unit **Must only be used** when screwed onto the front filter unit, with red ERF.



**Do not attempt** to screw front filter unit on and off adapter plate using only one hand. **Always use both hands** one underneath front filter unit as support, use other hand to screw front filter unit on and off adapter plate. Do not over tighten front filter unit. Replace protective caps to filter unit when removed from the telescope and store filter units in the carrying case for protection. Mount secondary blocking filter unit into telescope focuser draw tube, then attach star diagonal.

**Care of optics** Do not wipe dust or grit off optics with cloth, use photographic lens puffer to blow away loose dust particles. Use good quality optical lens cleaner with disposable lens tissue. Do not "dab" at dirty areas, pull tissue

towards you with a constant but light pressure over optical surface. Always replace protective end caps to instrument units when not in use. **Under no circumstances** should the user attempt to alter or remove any part of the Solarview telescope or Solar Filter system. The instruments are sealed after final testing and as constructed are safe for solar viewing. Attempts to alter, disassemble or tamper with the instruments will compromise safety, may result in personal injury and will void guarantee.