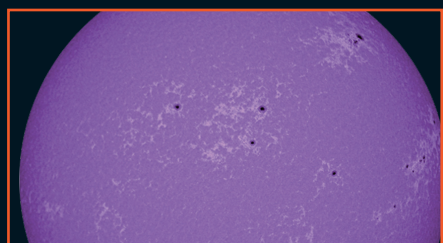
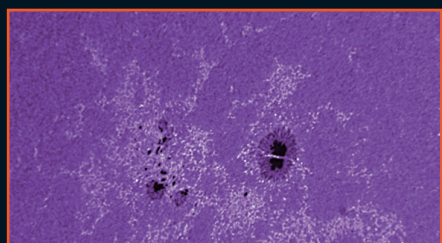
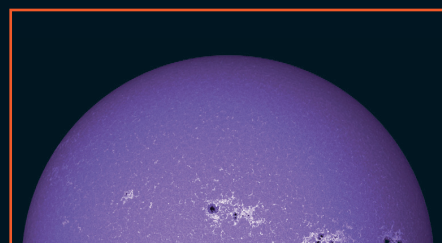


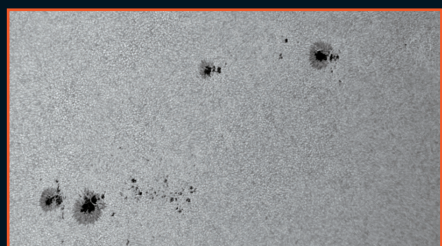
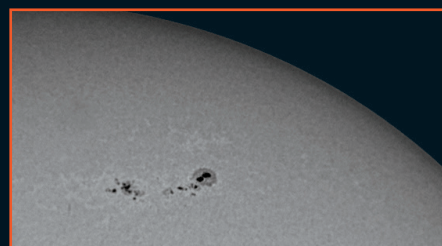
## Calcium-K (Ca-K) Filter Modules

Not only in H-alpha, also in the wavelength of Calcium-K the sun will show you many interesting events. Because deeper layers of the solar surface are observed in the blue Calcium-K light than in the red H-alpha light, other details emerge in this Ca-K wavelength. But the Ca-K wavelength is at the edge of the visible light spectrum for human eyes. Observers in their younger years can often see numerous things, but with increasing age less and less can be seen in this wavelength. Therefore, the Ca-K modules from Lunt Solar Systems are optimized primarily for imaging. The Ca-K modules are designed to retrofit your astronomical refractor telescope up to 4" (100 mm) aperture for observing the sun in the Calcium-K wavelength during the day. The modules are alternatively installed in star diagonals or straight extension tubes. These diagonals and extension tubes are equipped on the eyepiece side with a T2-connection for cameras and a reception for 1.25" eyepieces. All needed IR and UV cut filters are integrated, internal narrowband filters allow for a <math><2.4\text{ Angstrom}</math> bandwidth. Put the module in the 2" focuser of your telescope, that's all - observing the sun in Ca-K light can't be easier.



## White Light Herschel Wedges

Herschel Wedges / Solar Wedges will be used to observe the sun with refractor telescopes in white light. The difference between Herschel Wedges and normal front mounted filters is, that the filtering takes place just before the eyepiece or camera. This will provide a better contrast and sharpness of the solar image. Because the full energy and heat of the sun will be inside the telescope, we advise to use only refractors up to 150 mm aperture with a Herschel Wedge. The Herschel Wedges are available in 1.25" and 2" size.



## Accessories

Lunt Solar Systems offers a wide range of useful accessories for the solar observation and for the upgrading of existing systems from Lunt Solar Systems.

Available are:

- H-alpha optimized eyepieces
- sol-searcher
- adapter plates for front-mounted filters
- optional blocking-filters
- dovetail bars
- adapter for using 2" accessories at Lunt telescopes and filters
- several other adapters
- focuser
- ERF Energy-Rejection-Filter



## The fascinating experience of solar observation

Amateur astronomers admire and observe the starry night sky. But the stars themselves can not be really observed in detail. No matter how big the telescope is, a single star will always be only a small point.

Our sun is the only exception. The sun is close enough to see clearly the fascinating details. And the sun is almost alive, it can surprise us daily with new events, sometimes new events appear in only a matter of minutes. There is much more than only the famous sunspots. Powerful eruptions, known as prominences, rise up from the edge of the sun and fall back down on the surface finally. Also the surface itself is generous with exciting effects, like turbulences, flares, and filaments. Unbelievable enormous quantities of vibrant energy, directly before your eyes.

With conventional solar filters that only dim very strong the light, you can only observe the sun in the so-called "White-Light". Here, however, are only the sunspots visible, and if you are lucky a little bit of the granulation on the solar surface. For the really exciting effects you need involved high-tech filter that allows observing the sun in a single, very specific wavelength. Two of such wavelengths are practical for the visual observation or photography by amateur astronomers: the H-alpha (Hydrogen Alpha) wavelength of ionized hydrogen at 656,28 nm, and the light of the Calcium-K line (Ca-K) at 393,4 nm.

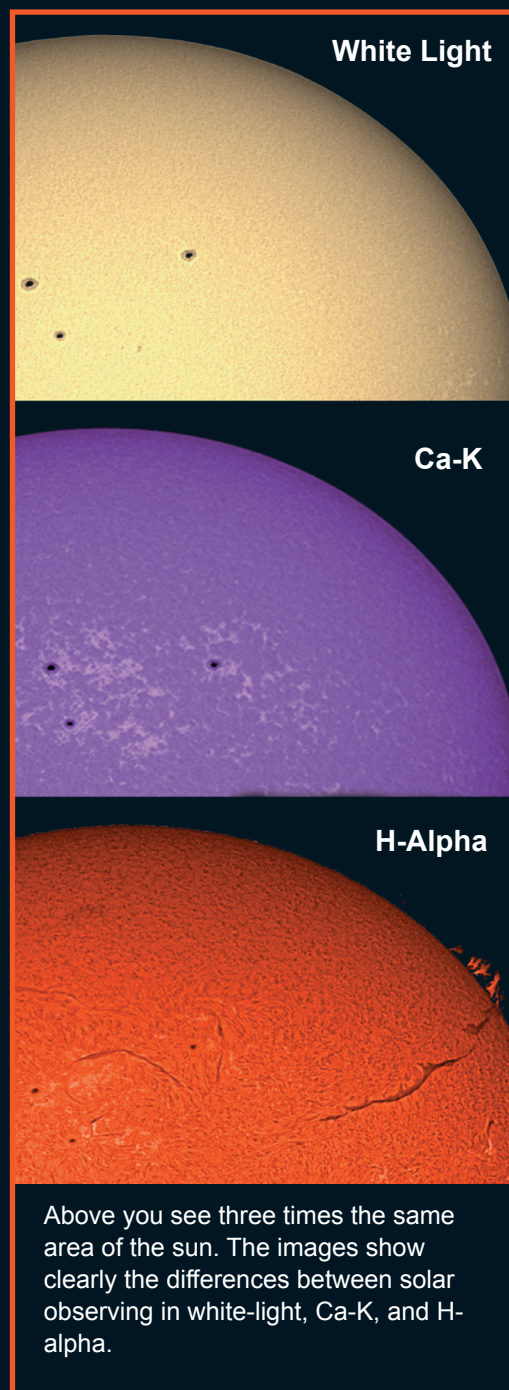
It is technically very challenging to manufacture such filters, the so-called "Etalon", that will be paired together with a "Blocking Filter" allow pass through only of one wavelength. No filter by itself can do this really exactly. How accurately a filter can really isolate the light of only one wavelength is defined by the "bandwidth". The smaller the value of the bandwidth is, the more accurate the filter will isolate the wavelength. And the more accurate the wavelength is isolated, the more details you will see on the sun. In the H-alpha range the bandwidth of the filter should be in any case smaller than 1 Angstrom (1 Angstrom = 0.1 nm). At the wavelength of Ca-K bandwidth values around 2.5 Angstrom will give you the most details.

Lunt Solar Systems offers the next generation of solar filters and telescopes. If you want to upgrade an existing astronomical telescope with a filter system for observing the sun, or if you want a complete solar telescope that is right now ready to use - Lunt Solar Systems will guarantee not only fascinating views of the sun, but also 100-percent safety and protection from dangerous radiation of the sun. We also assure the best quality and always new innovations, like the air-pressure-tuning system "Pressure Tuner" for the fine adjustment of the Etalon, or our new internal double-stack system DSII.

**Enjoy unforgettable views of our sun - with the advanced solar telescopes and filters of Lunt Solar Systems!**

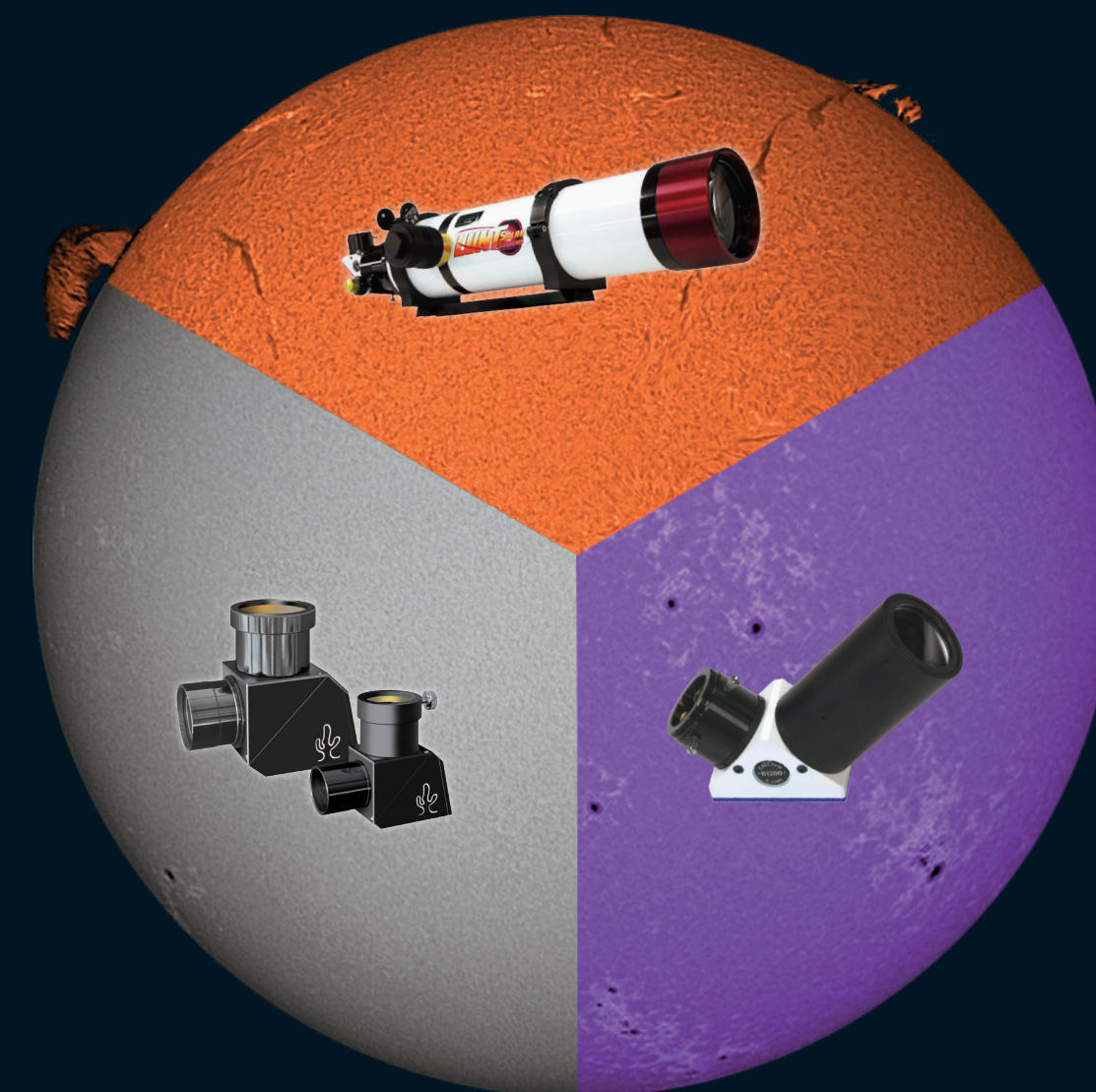
You will find much more information and technical data about the Lunt Solar Systems telescopes and filters in the internet at our homepage.

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Above you see three times the same area of the sun. The images show clearly the differences between solar observing in white-light, Ca-K, and H-alpha.

## The Next Generation of Solar Telescopes and Filters



**H-alpha Telescopes and Filters • Ca-K Filters • White-Light Filters**

Your Lunt Solar Systems specialized dealer:

## H-alpha Solar Telescopes

Complete H-alpha telescopes from 50 mm up to 230 mm aperture, to observe and image the sun at the wavelength of 656.28 nm. By far the most vivid and entertaining emission line, it will show you many interesting details of the sun. The telescope systems are optimized to provide the highest performance in compact packages and are unobstructed. All Lunt Solar Systems telescopes will be delivered with a star-diagonal in which the blocking filter is installed. These star diagonals are standard equipped with a reception for 1.25" eyepieces and a T2-connection for cameras. The larger telescopes are also available with the straight B3400, which allows using of 2" accessories.

### LS50THa

The LS50THa telescope has a free aperture of 50 mm, 350 mm focal length, and is equipped as standard with the tuning system "Pressure Tuner". The perfect start to observe the sun in H-alpha wavelength. Also available is the compact double-stack filter LS50C as additional accessory.



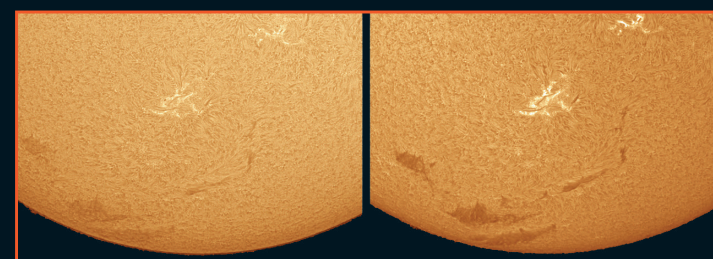
### LS60THa

These telescopes with 60 mm aperture and 500 mm focal length provide a very good resolution for solar observing and imaging. Thereby the telescopes are still very easy to handle and also well suitable for travelling. The sensitive Etalon systems are installed well protected inside the telescope tube and provide a bandwidth around 0.7 Angstrom. The telescopes are available with the innovative "Pressure Tuner" or with a classical tilt tuning system. At the text box beside you will find more information about the "Pressure Tuner" system.



### LS60THa Double-Stack Telescope

The bandwidth of H-alpha telescopes can be reduced significantly by combining two Etalon filters together. This so called "double stack" procedure allows many more solar surface details to come out. The LS60THa telescopes can be double-stacked with the 50 mm filter LS50FHa, or at full 60 mm free aperture with the LS60FHa filter. This reduces the bandwidth to less than 0.5 Angstrom.



Standard H-Alpha Telescope

Double-Stack

### What is the "Pressure Tuner" system?

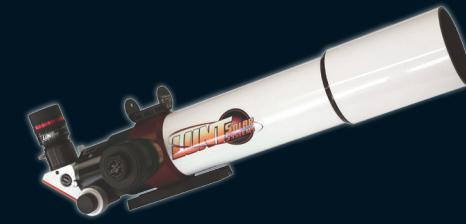
The air pressure of the atmosphere varies, depending on if you are at sea level or on a mountain. Unfortunately also the sensitive Etalon filter systems respond to these air pressure variations. The wavelength range that is allowed through the filters, shifts as a function of the air pressure. This shifting is indeed minimal, but at bandwidths of less than one Angstrom it is already clearly visible. If the filter is not adjusted precisely to the H-alpha wavelength, the image of the sun through the telescope degrades, prominences and surface details are no longer visible. Therefore, the Etalon filter systems have to be adjusted to the prevailing air pressure at the observation location. This "Tuning" called adjustment is typically done by a mechanical tilting of the filter. Because the tilted filter is no longer perfectly straight in the beam path, but slightly oblique, there may be optical failures like scanning effect or ghost images. The new air-pressure system "Pressure Tuner" by Lunt Solar Systems takes a different path. The Etalon filter will not be tilted to only simulate a balance to the air pressure, but the air pressure in the filter system is in fact adapted by 100 percent to the real external air pressure.



Thereafter the air surrounding the Etalon can simply be compressed or decompressed by the tuning system in order to change the air pressure between the surfaces. This allows the Etalon surfaces to always remain at the same perfect angle to the light waves but changes the diffractive index of the air in the chamber and thus accomplishes the same tuning expect that it goes around +0.4 to -0.4 Angstrom on either side of the centerline. This means that it is possible to tune in both directions of the light spectrum, to the blue part and also to the red part. Therefore, the patent-pending "Pressure Tuner" system from Lunt Solar Systems is also called "True Doppler Tuning". True Doppler Tuning allows for a bandpass shift "into and away" from the user, adding a 3D like component to the viewing experience. While it has minimal effect on prominences due to their being at the edge of the disk, it does have an effect on filaments and active regions on the surface. While looking at a filament on the surface of the sun, the user has the ability to Doppler shift the view from the base of the filament to the top, following the filament through its structure effectively toward you and away from you. Doppler Tuning allows for enhanced visual and imaging capabilities for the observer as well as a research tool for the avid hobbyist. The Pressure Tuner system is a more precise method for tuning and achieves much better results than conventional tuning systems.

### LS80THa

For the advanced solar observer we offer this ED refractor with an aperture of 80 mm and 560 mm focal length, of course fully unobstructed. The H-alpha telescope is equipped as standard with the air-pressure tuning system "Pressure Tuner", whereby the internal Etalon achieves a bandwidth of <0.7 Angstrom. A dovetail plate for astronomical mounts, a Sol-Searcher, a zoom-eyepiece, and a transport case are included. The telescope LS80THa is upgradeable with the new DSII double-stack system, that provides a bandwidth <0.5 Angstrom.



### DSII Double-Stack System

Until now an external front filter was ever required for double stacking an H-alpha telescope. The new DSII system offers double stack modules for the Lunt telescopes, which are integrated safely in the telescope. The modules are easy to install, it is not needed to ship the telescope back to the manufacturer. And the double stack modules are equipped as standard with the Pressure Tuner. The DSII modules are available for LS80THa and LS100THa, and now also for the large LS152THa telescopes.

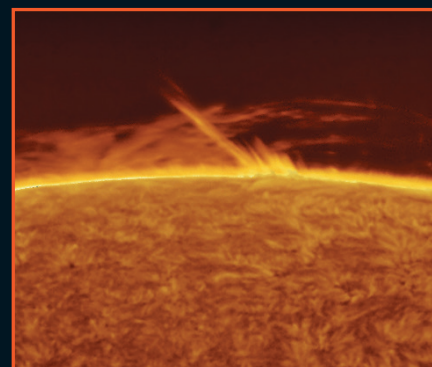
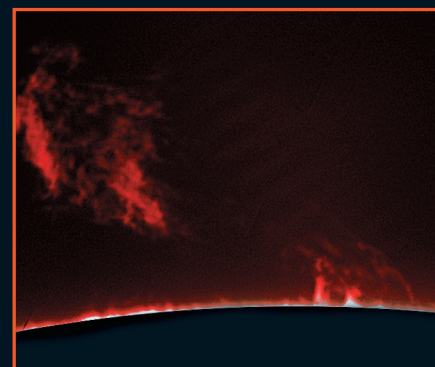
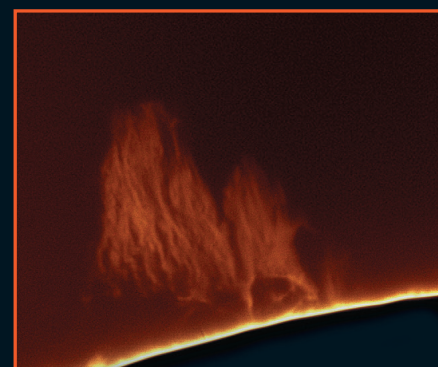
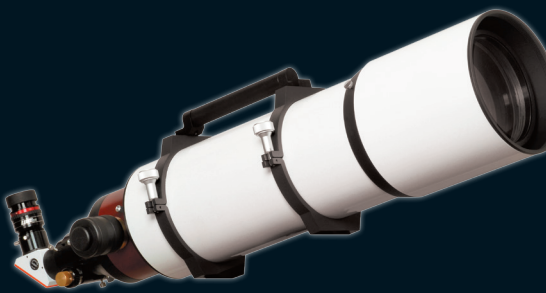
### LS100THa

These H-alpha telescopes with 102 mm aperture and 714 mm focal length offers with an internal Etalon system a bandwidth of <0.7 Angstroms. Professional accessories such as Feather-Touch focuser from Starlight Instruments, sol searcher from TeleVue, and the new air-pressure tuning system "Pressure Tuner", belongs to the standard equipment. Tube rings with dovetail plate and a robust transport case are included in the package. A instrument for the ambitious solar observer. Additionally the LS100THa telescopes could be purchased with the optional available 100 mm external, front mounted double stack filter LS100FHa, or with the new internal DSII Double Stack system, for a bandwidth of <0.5 Angstrom.



### LS152THa

A 6" refractor for solar observing: 152 mm aperture, 900 mm focal length, 100% unobstructed, and a bandwidth of <0.65 Angstrom - the solar telescope for professionals! If it is the perfect solar image you are after, than the LS152THa is the right system for you. Utilizing advanced hi-contrast coatings and the new air-pressure tuning system "Pressure Tuner", the user will be able to experience crisp, sharp, high-magnification visual and digital images. Also at this telescope double-stacking is possible by using the DSII system. But there is more: the design of the LS152THa is modular. You can also observe the sun in Ca-K and white-light with optional accessory, and even use the telescope for observing the starry night sky. A real multi-purpose telescope!



### LS230THa

The largest in serial production manufactured H-alpha solar telescope in the world: A refractor system with a aperture of 230 mm, and 1600 mm focal length. And this giant refractor is fully unobstructed, like all Lunt Solar Systems telescopes! Utilizing both, advanced high-contrast coatings and the innovative air-pressure tuning system "Pressure Tuner", the user will be able to experience an un-paralleled level of visual and imaging performance. Please ask our customer service about delivery times and prices if you are interested, because the LS230THa telescopes are manufactured only in small quantities.



### Electronic Pressure-Tuner Controller PC1

Normally the "Pressure Tuner" system is mechanical hand controlled. But now the microprocessor controlled pressure control system PC1 is also available. The PC1 controller can be easily retrofitted to any LUNT instrument with "Pressure Tuner". The PC1 is accurate to 0.027 Bar (0.4 PSI), providing very precise control of the "Pressure Tuner" system.



## H-alpha Solar Filters

With the H-alpha filters from Lunt Solar Systems you can upgrade normal astronomical telescopes for observing the sun during the daylight. There are three different filter-sizes available, the LS50FHa with 50 mm aperture, LS60FHa with 60 mm, and LS100FHa with 100 mm aperture. LS50FHa and LS60FHa are un-obstructed, only the very large LS100FHa needs spacer in the light-path. The systems includes an Etalon filter for front mounting on the telescope and a blocking filter for the focuser. We manufacture adapter-plates by customer specifications for the front mounting of the H-alpha filter at your telescope. The blocking filters are available alternatively for 1.25" or 2" focuser. These blocking filters are equipped with a reception for 1.25" eyepieces and a T2-connection for cameras on the eyepiece side, only the very large B3400 has a 2" connection at both sides. The LS50FHa and LS60FHa can be also used for double-stacking the LS60THa H-alpha telescopes. You can even double-stack the large LS100THa telescopes with the LS100FHa filter!

### LS50FHa

These filters provide a bandwidth of <0.75 Angstrom, and a good resolution by an un-obstructed aperture of 50 mm. Certainly, also double stacking is possible to reduce the bandwidth to <0.55 Angstrom.



### LS60FHa

The LS60FHa filters provide a bandwidth of <0.7 Angstrom, and a un-obstructed aperture of 60 mm. Also at these filters double stacking is usable to reduce the bandwidth to only <0.5 Angstrom.



### LS100FHa

With 100 mm aperture and <0.7 Angstrom bandwidth these large filters will show an unexpected wealth of details to the ambitious solar observer. And even these most demanding sufficient quality could be increased with a double stack filter, the bandwidth then will be <0.5 Angstrom.

