

Sol'Ex slit GEN2

Sol'Ex/Star'Ex project : <http://www.astrosurf.com/solex>

Christian Buil, October 2024

The Sol'Ex GEN2 slit (second-generation slit) is a precision component designed for the Sol'Ex instrument, the SUNSCAN, or any other spectrograph requiring a fine and precise entrance slit. It is presented as a glass plate measuring 12 mm by 8 mm, with a thickness of 2 mm. This slit is available from Shelyak Instrument at the following link:

<https://www.shelyak.com/produit/solex-sunscan-2-position-slit/?lang=en>

For compatibility with Sol'Ex, a special 3D-printed interface piece is required. The STL files for this part are provided below.

Key Features of the Sol'Ex GEN2 Slit:

- The optical component actually has two parallel slits on the same glass substrate, selectable according to need. Lithographically etched into a chrome layer, these slits measure 10 and 7 microns in width, respectively. By rotating the slit 180° around the optical axis in the 3D-printed holder, you can choose one or the other. The 10-micron slit is generally recommended for standard use with Sol'Ex.
- Slit length: 6 mm.
- The substrate is made of special glass that is more heat-resistant than standard glass.
- The side opposite the chrome layer is anti-reflective coated.
- The 2 mm glass thickness makes the optical component relatively robust and simplifies surface cleaning, especially for dust removal.

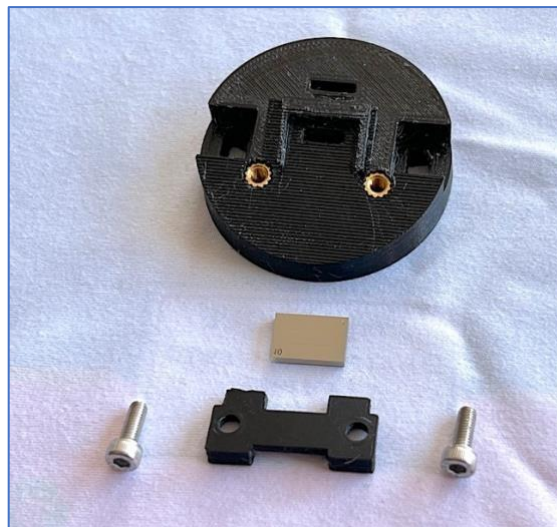
As noted, using the Sol'Ex GEN2 slit requires a specific 3D-printed holder with a clamp. This part optimally positions the slit in the Sol'Ex collimator cube without modification, whether for the original Sol'Ex (V1) or for the Azur3DPrint modified version (V2) (see <https://azur3dprintshop.com>). The corresponding STL files are available at the following links:

http://www.astrosurf.com/buil/starex/slit_solex_gen2.stl

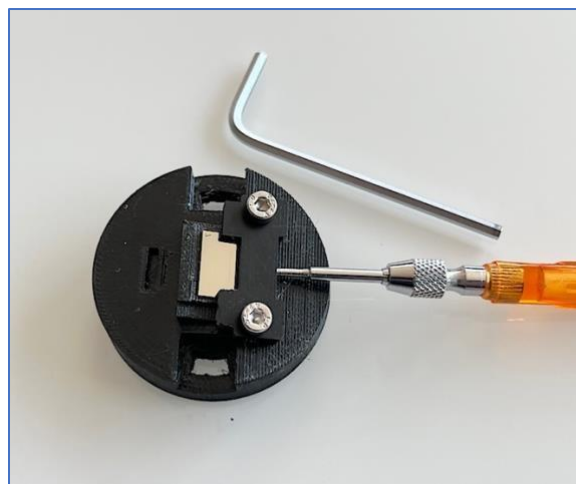
http://www.astrosurf.com/buil/starex/flange_solex_gen2.stl

Warning: if the slit holder is printed in PETG, make sure that, when pointing your instrument toward the Sun, the temperature at your telescope's focal point remains manageable. To check, place your palm there for about 30 seconds to confirm you can hold it without burning. A well-calibrated Sol'Ex instrument should meet this requirement. If the temperature is too high, it is advisable to print the holder with a more heat-resistant material, such as carbon fiber-reinforced PETG or PC if your printer allows. As a last resort, adapt the interface piece in metal.

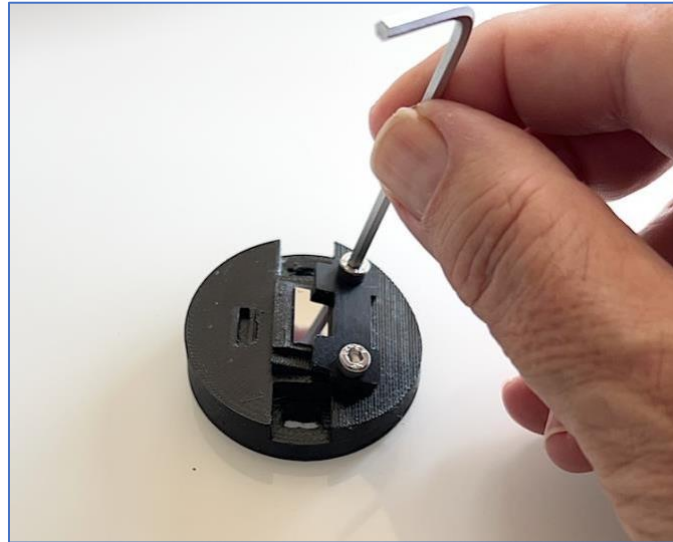
The appearance of the Sol'Ex GEN2 slit and its mounting assembly, with the addition of two M3 inserts, is as follows:



When assembling the slit, remember to press down firmly on the shoulder:



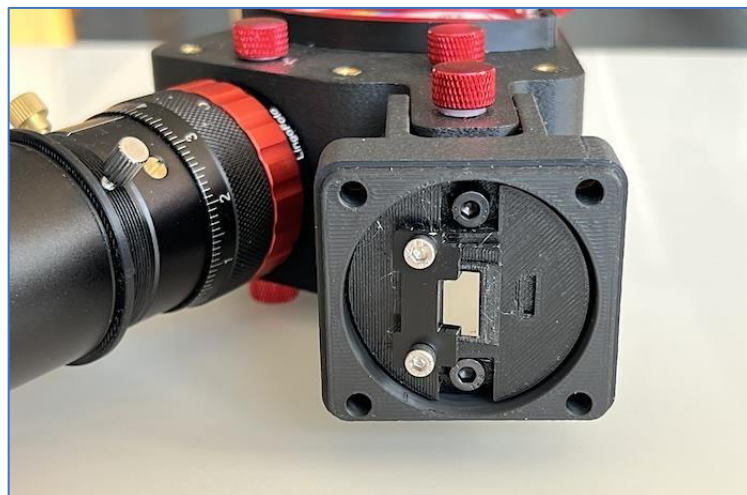
There's no need to tighten the two M3 flange retaining screws:



GEN2 slit mounted in its holder. For use with Sol'Ex, we recommend turning the slit so that the chrome-plated side faces outwards (the letters indicating slit widths are then read in reverse):



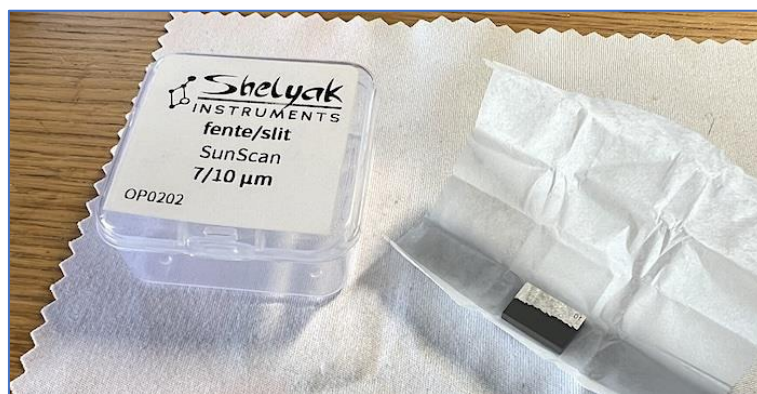
The Sol'Ex GEN2 slit installed in the Sol'Ex instrument:



APPENDIX: Cleaning the slit

Let's recall that the Sol'Ex GEN2 slit is a small glass plate measuring 12 mm by 8 mm, with a thickness of 2 mm. One face is coated with a thin layer of chrome, etched with two parallel slits that are 7 and 10 microns wide. The other face has an anti-reflective coating.

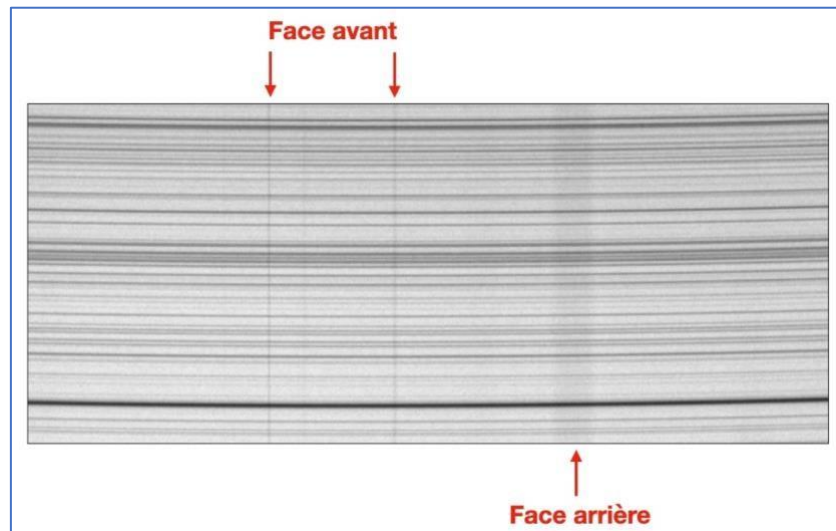
Upon opening the box, place the slit into the Sol'Ex holder, taking care to avoid any contact with the optical surfaces (handle it by the edges only). Following this method, it is highly likely that the slit will not require any cleaning.



Occasionally, an incident may require cleaning both sides of the glass plate. Although the coatings on these sides are relatively durable, it's essential to remember that these are optical components, requiring special care. Avoid rubbing them with paper or a used cloth, and do not use standard cleaning products, especially those meant for household windows.

The main issue arises from dust particles that may accidentally settle on the narrow width of the slit, creating characteristic vertical streaks in the recorded solar spectrum. Be careful not to confuse these with the passage of a sunspot across the slit. These streaks, referred to as "transversalium" in our jargon, are perpendicular to the direction of the spectral lines.

Dust particles may, of course, be present on either side, so it's essential to determine their location. Given the slit's 2 mm thickness, dust on the chrome-coated side appears sharp, along with the spectral lines. In contrast, particles on the opposite, defocused side appear broader and blurry:

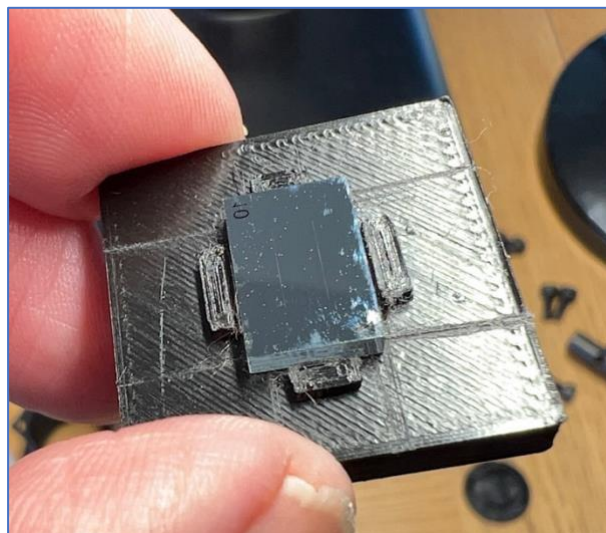


Here are some tips for cleaning.

The slit's substrate is small, making it challenging to handle. It is recommended to use a small, 3D-printable support tool, with the STL file available for download at the following link:

http://www.astrosurf.com/buil/starex/tool_solex_gen2.stl

The Sol'Ex slit mounted on its cleaning support. Use a desk lamp with a relatively low angle light to clearly highlight any dirt or debris.



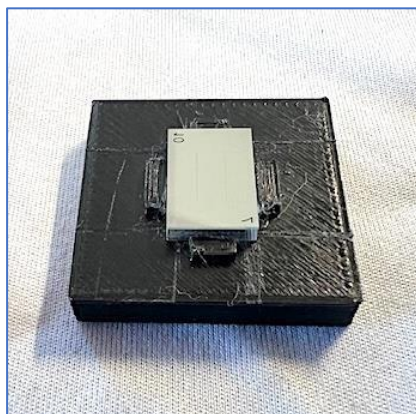
The most problematic dust particles are those on the chrome-coated side, as they produce fine transversalium traces, which are more difficult to remove during data processing.

Required materials:

- The Sol'Ex GEN2 slit support, of course.
- A holding tool for the slit to ease cleaning.
- A magnifying glass.
- Cotton swabs.
- A lens-cleaning spray, available at optical stores; Purosol is a highly recommended option.
- A can of compressed air.
- A desk lamp to illuminate the slit clearly.



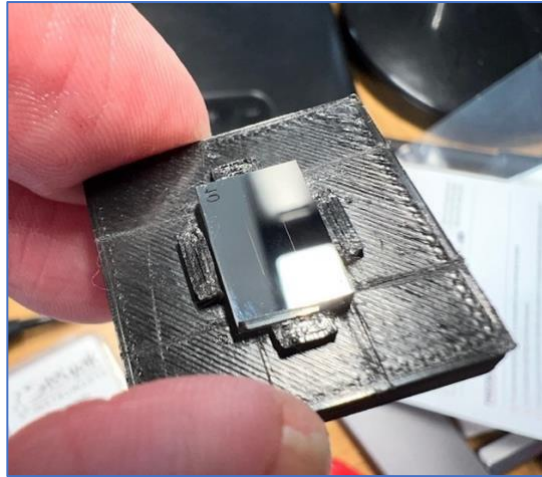
Below is the slit on its support, which reduces the risk of contaminating the surface with fingerprints.



It is important to identify the relevant glass face, specifically the one coated with chrome. As a reminder, in the Sol'Ex, the chrome-coated side of the slit (where the slit is photolithographed, meaning the exact plane of the slit) faces outward, causing the inscriptions to appear upside down once installed.

It is best to wipe the surfaces with cotton swabs. However, most cotton swabs used dry unfortunately leave behind dust residues. A good technique is to wipe not with dry cotton but with a cotton swab slightly moistened with Purosol. This way, dust particles adhere to the cotton, and the cleaner evaporates very quickly without leaving any marks.

After cleaning:



As a last resort, you can try to blow away residual dust or cotton fibers using a can of compressed air. Be careful, as it is very important to follow a few rules when using this type of compressed air canister: (1) purge with one or two short bursts to remove impurities before approaching the slit, and (2) blow with the nozzle always held horizontally and the canister in a vertical position; this is crucial to avoid propelling anything other than dry air onto the glass surface.

If the dirt is really stubborn, you can try using an ultrasonic tank, designed to clean eyeglasses in particular (satisfactory models are available for less than 50 euros):



Hold the slit in the jaws of a small mechanic's clamp with plastic tips, with the chromecoated side facing down. Fill the tank with mineral water. Do not use detergent or soap, as these may leave residues upon drying; use only clear water. Operate the tank for 4 to 5 minutes. Then, allow it to dry naturally without rubbing. Next, use a cotton swab lightly moistened with Purosol to remove any marks and dust (or, if necessary, distilled water). Avoid using a dry cotton swab afterward to prevent depositing new dust.