

Precision Glass Cutter Manual

07630-AB, 07631-AB, 07632-AB, 07633-AB

SPI Supplies – 206 Garfield Ave, West Chester, PA 19380

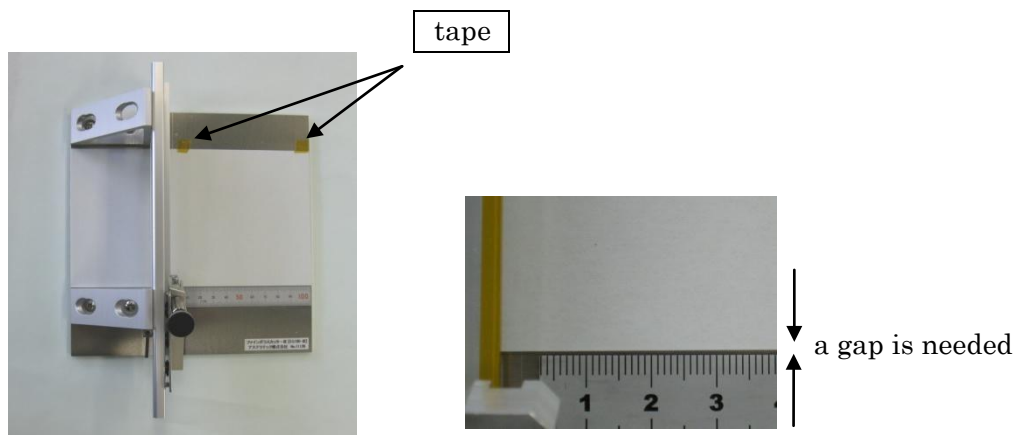
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*** Caution: Always wear safety glasses and gloves when cutting glass.**

1. Preparation for glass cutting

To avoid scratching or damaging the substrate surface during cutting, put down a clean sheet of paper. Replace the paper periodically as needed. To attach the paper to the glass cutting table, use adhesive tape as in the picture below. Leave a small gap between the paper edge and the guide with scale (Do not tape to the guide with scale.). If there is no gap, the glass may raise if the paper swells due to excessive humidity.

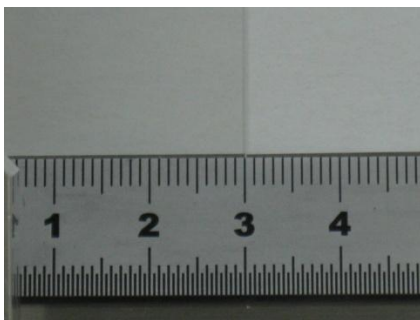


2. Holding the glass

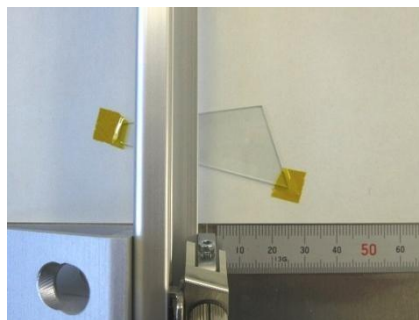
To hold the glass while cutting, either tape it to the table or use your left hand to hold it in place. Optionally, use a magnetic substrate holder (SPI# 07640-AB / 07641-AB, sold separately) to hold small pieces of glass.

To cut a glass plate to 3cm in width, place the edge of the glass plate to 3cm of the guide scale and hold the other end of the glass with your left hand.

To cut glass pieces in shapes other than squares or rectangles, tape two edges as shown below.



Glass positioning



Holding an irregular shaped piece of glass

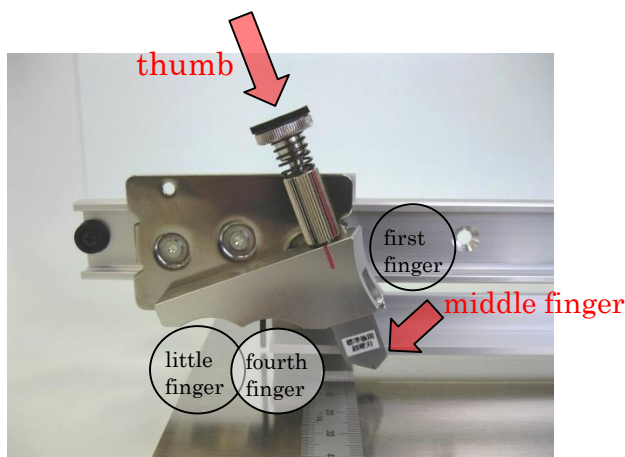
3. Scribing

3.1 Push the plunger handle with your thumb using appropriate power for the glass thickness (excessive pressure will shatter thinner substrates)

Use your fourth finger should push the wheel cutter gently to the guide rail. This is to make the scribe line as straight as possible.

Your middle finger should push the wheel cutter in the direction of arrow. The strength of this finger will adjust the scribing depth.

Move the wheel cutter to the glass edge. Scribe the glass while feeling the wheel cutter running on the glass. Your middle finger should feel that the cutting wheel is firmly scribing the glass. To begin, scribe slowly so you can feel the cutting wheel firmly running on the glass. This is to scribe deeper at the edge.



Fingers positions on the head



Actual picture of fingers in each position

3.2 Release the plunger head slightly backward at this time to ease the pressure. Scribe the glass plate by sliding the head with uniform strength and speed.

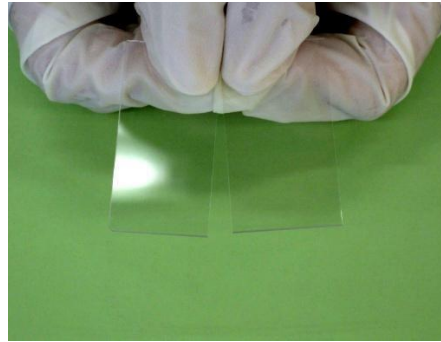
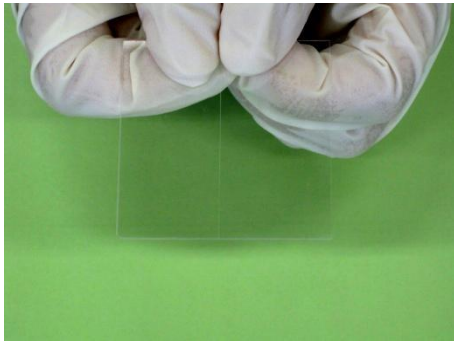
** Never slide the head back at this time.*

3.3 Scribe slowly with slightly more pressure towards the end of scribing, similar to the start of the scribing line. If the glass is very thin, there is no need to slow down. If the glass plate is thicker, it is easier to break if the scribing is slightly deeper at both edges of the glass.

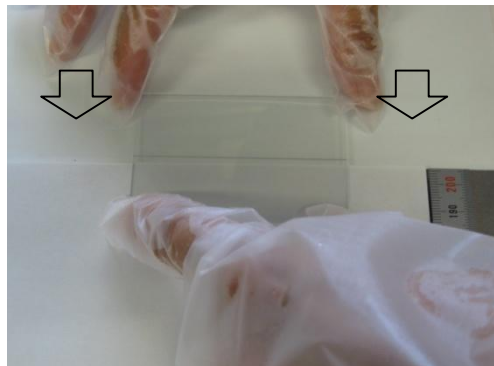
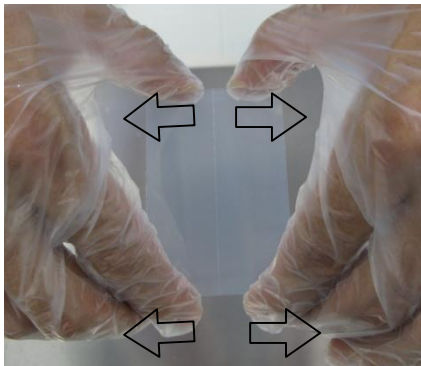
** If you want to cut crystalline material such as Si wafers, scribe it along its crystal orientation.*

4. Breaking the glass

Hold the glass plate near the scribe line with your thumbs and first fingers. Your right thumb and left thumb should hold just to the right and left of the scribe line, as depicted below.



If scribed properly, the glass will break by pulling each side in opposing directions while holding the plate edges as in the left picture below. If the scribing is not deep enough and will not break in this way, put the glass on the base plate by aligning the scribe line 1mm from the edge of the plate as in the right picture below and apply gently pressure to overhanging edge.



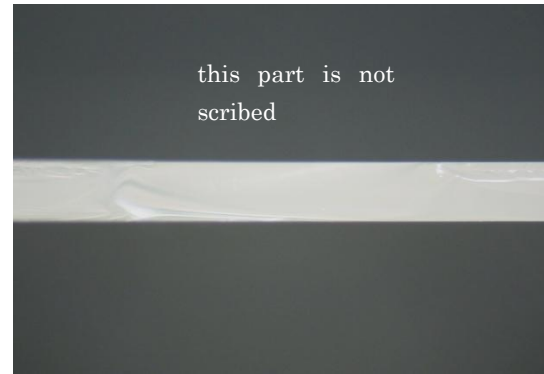
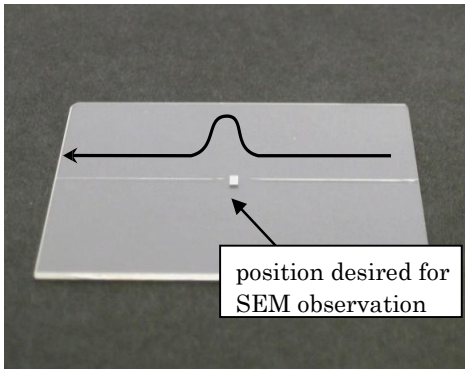
5. If glass will not break

If you still cannot break the glass because the scribing is too shallow, tap the glass plate around the scribe line gently with a relatively soft plastic tool. This will progress the glass cracking a little so that you can break it with your hands. If you still cannot break your target, use a glass breaking plier (SPI# 07677-AB, sold separately). If none of the above work try to scribe the glass again.

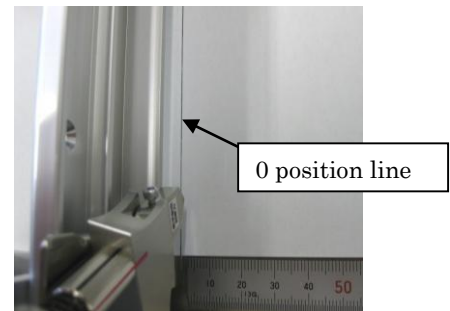
6. How to make a good sample for SEM

To make a SEM sample glass, the broken-out section must be very straight. To avoid cracking the broken-out section, break the glass by pulling, not snapping it.. For a SEM sample for the cross-section of a thin film, scribe the glass in the bottom surface. If you need to scribe in the top surface, do not scribe the middle part. However, leave only a small part un-scribed (several mm

is enough). If this part is too long, the glass may not break along the scribe line. See the images below.



This method is effective for a local (several mm) cross section sample of the glass plate or Si wafer on which a film is deposited. (Draw a straight line on the clean paper that the wheel cutter runs through. This will make the sample positioning easier.)

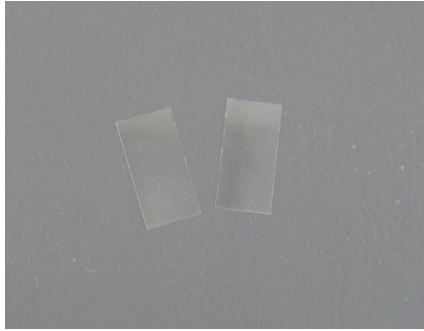


7. How to cut an ultra-thin glass plate (example: 0.15mm-thick cover glass)

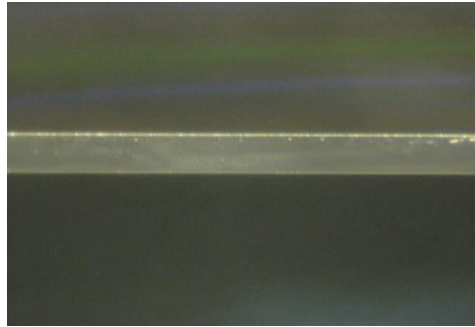
To cut ultra-thin glass less than 0.5mm thick, scribing must be shallow and uniform. In the case below, a 0.15mm-thick cover glass is scribed and broken.

When the glass is very thin, it can easily break while scribing on the clean sheet by the stress concentration. Do not use a paper sheet - use something firmer such as a thick glass plate. Clean the glass plate thoroughly before putting the thinner glass on - if any debris is left on the plate, the thin glass will easily break

Adjust the height of the cutting wheel to the thickness of the glass to cut (see separate included manual on **Replacing the Cutting Wheel and Adjusting the Height of the Cutting Wheel**). If you want to scribe a 0.15mm-thick glass plate, adjust the height adjusting screw to 0.15. However, as the scribing depth depends on the roughness of the glass plate and the parts deformation that occurs by the scribing pressure, this is only a suggested starting point, and further experimentation may be needed to find the optimum setting. The scribing depth will be around 10 to 20 μm when the glass is as thin as 0.15mm. The pressure applied to the cutting wheel must be gentle. The following pictures are a broken cover glass and a cross section of it.



Broken cover glass



Cross section of a 0.15mm-thick glass plate

8. Cutting materials other than glass

8.1 Precautions for cutting these materials:

For a single crystal substrate, scribe along the crystal orientation. Generally, crystalline materials will break along the crystal orientation.

8.2 Selection of cutting wheel:

Use diamond cutter for hard substrates such as sapphire. If the substrate is moderately hard such as SrTiO₃, a carbide cutter will work, but diamond is recommended. The appropriate distance between the cutting wheel and the plate depends on the type of crystal. Some experimentation may be needed to find the proper cutting wheel and distance.

** All the plate thicknesses listed in our manual are for glass – when cutting materials other than glass, some experimentation may be needed to determine the proper parameters.*

9. Maintenance of the cutting wheel

The cutting wheel will wear eventually, although the exact time depends on usage. If the cutting wheel is worn, scribing cannot be done as smoothly. If there are glass particles adhered to the cutting wheel, this will also affect the quality of the scribe. If there is a degradation in the quality of the scribe line, clean the cutting wheel first. If it still does not solve the problem, replace it with a new wheel. To determine if the cutting wheel is damaged or not is most easily done by inspecting it using a stereo microscope. To clean the cutting wheel, use unwoven cloth soaked with alcohol and roll the cutting wheel on it.

10. Replacement Parts

Please see the table below for a list of replacement parts, as well as optional accessories for your Precision Glass Cutter:

DESCRIPTION	SPI SUPPLIES PART #
Replacement Precision Adjustment Head	07634-AB
Replacement Wheel Cutter – Carbide – for materials 0.15-0.5mm thick	07635-AB
Replacement Wheel Cutter – Carbide – for materials 0.5-1.3mm thick	07636-AB
Replacement Wheel Cutter – Carbide – for materials 1.1-3.0mm thick	07637-AB
Replacement Wheel Cutter – Diamond – for hard materials 0.15-0.5mm thick	07638-AB
Replacement Wheel Cutter – Diamond – for hard materials 0.1-1.3mm thick	07640-AB
Magnetic Substrate Holder for materials up to 100mm in size	07641-AB
Magnetic Substrate Holder for materials up to 200mm in size	07642-AB
Glass Breaking Pliers	07677-AB