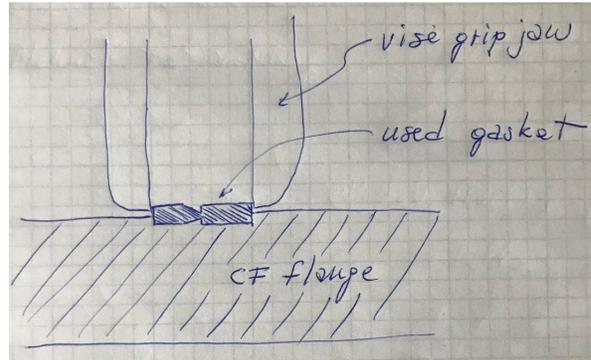


## Good laboratory practices

12 Nov 2020

### Metal seals

- Wear gloves. No need to get grease or anything in the way of sealing but also always a good idea if you only think about vacuum quality
- Never use screwdrivers or other prying objects to remove used Conflat (CF) gaskets, as there is a high risk of damaging the knife edge of the flange. Do use a vise grip to grab the used gasket “radially”, as shown in the figure and pull straight away from the flange. If you use CF you **MUST** have a vise grip in your lab. (gaskets tend to be hard to remove particularly for large diameter flanges (which are also more expensive)).
- Only use silver plated bolts on CF flanges. Plain stainless bolts tend to get stuck (cold weld) to the nuts (or, much worse, blind threaded holes in expensive parts, like gate valves or cubes!). There should be **NO** plain stainless bolts in our labs, if you find one, mercilessly put it in the garbage.
- Never leave unprotected CF flanges. **Thick** (not cooking grade) aluminum foil is acceptable for 2-3/4” CF, but larger flanges need to be paired together, using a used gasket, and bolted together with 2 (or more) bolts.
- Plate nuts are convenient as they do not require a second wrench for tightening (but in some places plate nuts can’t be used)
- Rotatable CF flanges are particularly delicate because the knife edge is typically way more exposed. Use extreme care!
- “Clips” are funny devices used to hold a gasket in place during installation. A photo of clips in use is shown to the right. These are really useful, particularly for flanges in places hard to reach. Make sure you have some of them in the lab. They may exist only for 2-3/4” flanges and, oddly, are unknown in Europe. Giorgio has some spares in his office: ask.
- An alternative to clips is to place two strips of scotch tape at the edges of the gasket, making sure not to cross the knife edge (one can even stick to the perpendicular OD face). After the bolts are placed, the scotch tape can easily be pulled off from the outside.



- At first order avoid “miniCF”. They are finicky and hard to work with (screws are too small for the job)
- Tighten CF flanges in a star rotation (i.e. start with opposite bolts)
- At “any order”, avoid 1” VCR. Basically it does not work, unless you have a hydraulic wrench to tighten it.
- Swagelok sells Ni, Stainless and copper gaskets for VCR fittings. Do not use/buy the copper gaskets as they get mushed in the seal, leak and are often impossible to remove. Swagelok seems to have forgotten why they make them... Ni and stainless gaskets work the same way, as far as we know.
- VCR fittings are damaged by being assembled without the gasket. Never do this! (incidentally, “fixed” CF cannot be damaged this way, as the knife edges are slightly recessed. Rotatable CF flanges, of course, can be damaged this way -see above).
- Best way to tighten a VCR fitting is to hand tighten first and then use one hand for both wrenches or two hand but with small angle (if you think you need a large angle, think again and you will find a solution with small angle) to put forces to best use