VST Precision Filter FAQ

1. Filter Basket General Information

Significant advances in manufacturing state of the art have made high quality filters possible for the first time. Invest in a set of VST Precision Filters to ensure all groups operate identically, at a single grind setting.

A properly designed and manufactured filter will have a narrow distribution range of hole sizes, and will be tuned to extract in the center of the extraction yield curve for a narrow range of dose. All VST filters pass an imaging system test, *otherwise there is no way to know whether it was manufactured to specification.*

Because each [VST] filter is measured, you are assured that performance of all groups will be identical. Barista will no longer find themselves "hunting" for a new grind setting just because they're using a group with a filter that is significantly different than that of an other group (each one requiring its'' own adjustment of the grinder).

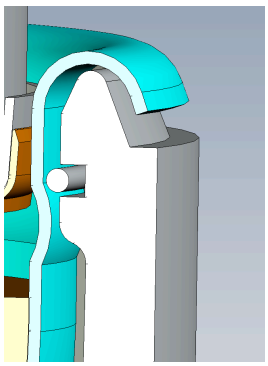
Use the recommended dose of coffee for a given basket (i.e. 20g +/- 1g in the 20g basket). If you err, it is best to do so on the low side (down to 19g). Do not use more than the recommended (21g) dose, doing so will force a coarser grind, which reduces the extraction yield as much as 1-2%, producing sour taste defects.

Ridged (Standard) versus Ridge-Less Filters

What is the difference between a ridged and ridgeless filter?

Performance is identical with Standard or Ridge-Less styles, and which one you choose is a personal preference, and will depend on how you're using it.

Some users like to remove the basket for every shot, and being able to do that without a tool is helpful for them. To remove a standard filter, you need to use a flat blade screw-driver to pry the filter rim away from the bayonet flat to disengage it from the spring clip. Some users also claim that cleaning a ridgless basket is easier and faster.



However, the ridge in a standard filter serves a purpose. It's designed to work with the spring clip (see image) and serves to pull the filter all the way down into the portafilter housing and hold it there. Notice the placement of the spring clip that fits into the portafilter groove; in a properly designed filter, it lands precisely against the top radius of the ridge. Some users have both Standard and Ridge-Less styles in their favorite sizes (dose capacities).

The down side [of a ridge-less filter] is that it may fall out into the knock-box during a vigorous knock, because the ridge is missing–unless the spring clip is kept new. The clip will tend to lose tension (fatigue) over time due to being deformed while idle at group temperatures, especially in commercial use where machines are run 24/7, so, if you use a Ridge-Less filter, it's a good idea to have spare spring clips on hand.

2. **Grinder**
Grinder burrs should be sharp and clean (i.e., not gummed up with coffee and oil residues). We've found that conical burr grinders work best, and seem to provide fewer fines (i.e., sub-100µm particles). We've had good luck with the Compak K-10 (WBC with Doser) and the Mazzer Robur series. An easy way to clear the grinder is to vacuum the throat and chute while the grinder is running empty, once per day after use.

3. **Tamper**
Match the tamper diameter precisely to the inside diameter of the filter. VST's precision filters maintain a tighter inside diameter tolerance. If the filter measures 58.7-58.9mm inside diameter, the correct tamper is 58.3 – 58.4 mm (never less than 58.3mm). VST provides a very nicely designed tamper matched to specifically to the VST Precision Filters, but any 58.3-58.4mm flat bottom tamper will do.

If the tamper is too small, it is more likely that side channeling will degrade both the uniformity of extraction as well as extraction yield performance, and may do so intermittently.

4. **Set proper pump pressure** (method courtesy of Scott Rao)
Start by using the "nominal" pressure typical of most traditional machines.

-Set pressure at the boiler to 9.0 bar
-Using a SCACE-II check to see that the pressure at the group is 8.0-8.5 bar (after typical losses in system plumbing, and assumes a 0.6mm gicleur)

If you don't have a SCACE-II try the following procedure to empirically arrive at the correct range of boiler pressure.

-tare a 0.1g digital scale
-pull shot using 22.0g dose (or whatever basket calls for)
-stop shot at 28 seconds
-record the shot beverage weight
-repeat this process for 9.0, 8.5, 8.0, 7.5, and 7.0 BAR at the boiler gauge (do not change the grind during this test)

The pump pressure that yields the most shot mass in 28 seconds is the one to use as a starting point.

Now, using the new pump pressure and 22g dose, adjust the grind to produce a shot of 32-35g beverage weight in 26-29 seconds. This procedure should produce a shot with extraction yields of 19-20% and concentration (TDS) of

12-14%, depending on your burrs, tamper, roast quality, and water.

If all of those factors are optimal, you'll be able to easily extract within this range and make a final adjustment to what ever you prefer for final taste profile. You'll find that it's easily repeatable, and forgiving of small variances. You can generally use +/- 0.5g dose and pull +/- 1g beverage weight, and still land consistently within the sweet range in terms of flavor profile.

If you were used to 16-17% extraction yields, this should be a very different, sweeter, deeper, riper flavor than you're used to.

Final note on pump pressure: (observation courtesy of Andy Schecter)
One would think that a higher group pressure would force a faster flow, which in turn would force a finer grind (to arrive at the preferred shot-contact time) and a higher concentration and extraction yield. In act, just the opposite happens. If the pressure at the group is too high, the puck is greatly compacted, reducing flow causing the user to grind more coarse, and is frequently the cause of under-extracted espresso. We confirmed this effect with measurements, and the effect of 10.5-BARs at the group was a 2% reduction in extraction yield, and the grind collar had to be set considerably more coarse than nominal. If pump pressure is too low, flow is also reduced. For most traditional machines, optimum flow is usually within a range of 8.0-8.5 bar (at the group).

5. **Coffee degassing and roast degree**
Allow fresh roasted coffee to rest for an appropriate period of time. Use coffee roasted at least 8, up to 15 days off roast (not a misprint). Some high elevation grown SO coffees are so dense, they may not extract normally until rested for 15-21 days post roast. This may seem unusually long, however, many high quality coffees take a full 3.6 months to off gas when stored in the whole bean state. If you are having trouble reaching nominal extraction yields, try pre-grinding your coffee 30-minutes before pulling shots. It should be stored in a one-way valve bag after grinding, to prevent oxygen from staling the coffee during the period you're waiting for the coffee to outgas.

De-gassing notes:
Up to 2% (by weight) of fresh roasted whole bean coffee is CO2 gas trapped in the cellular walls of the bean shortly after roasting. Pressure and temperature during espresso extraction amplify out gassing and contributes to the crema we find desirable. When the coffee is too fresh, excessive out gassing can reduce extraction yields considerably. The harder the coffee the longer out gassing will take. Some high-density Arabica beans will outgas in the whole bean state for up to 3.6 months. Out gassing is nearly complete in just a few hours after grinding, however. CO2 is partly inert, which helps preserve freshness by displacing oxygen, which accelerates the staling of coffee. This is why you should never store your coffee pre-ground, and it's recommended to use packaging that has a one-way valve. Each time you re-seal the bag,

squeeze out any air through the one-way valve. When the coffee is fresh, you'll notice the bag re-inflates. That's mostly CO2, not air, from the coffee out gassing.

Some roasters use Nitrogen to flush the bags during packaging, which is inert and displaces almost all of the oxygen (99.0-99.6%). Residual oxygen levels should be less than 1%, preferably <0.5% for maximum storage life.

Final comment on out gassing and freezing:
We do not recommend freezing whole bean coffee immediately after roast because it delays out gassing. If you insist on freezing roasted coffee, do so after out-gassing for 2-3 weeks in a sealed bag with one-way valve. We've had numerous complaints from users about low extraction yields, after they stated the coffee was 21+ days post roast, only to find it had been frozen 1-2 days post roast. In effect, it had not out gassed much at all. Another 8-10 days later the same coffee improved from 16-17 to nominal 20% extraction yields.

Coffee roast degree
Coffee must be fully developed at roast. Roasting is a very complex and difficult skill to master. Unfortunately, errors do occur that are difficult to detect because cafes demand that coffee be shipped fresh, immediately after roast, many times before the roaster has had time to QC the coffee due to the out-gassing time required. They must make educated estimates of projected final extraction yield, and ship based on less than ideal resting times.

Once you've settled on a coffee and a brewing protocol, you should mark the grinder collar setting so that you'll notice a significant change. Usually, if a batch was under-developed at roast (i.e., the inner most kernel of the bean has not been fully roasted) the grinder will have to move significantly in the more coarse direction than your *nominal* position, for normal flow rates. This is a red flag, and can be confirmed with both taste and measurement, because this always results in significant under-extraction. This topic is covered in more detail here.

6. **Water Chemistry**
This is an over simplification of a very complex issue, but these are the things most of us can measure for relatively low cost. You must have appropriate water chemistry.

Water TDS, hardness and alkalinity
The water TDS (total dissolved solids) should not be above 400ppm (TDS above this level can cross the taste threshold). A sub-set of water TDS are hard minerals, such as calcium and magnesium, and the preferable range for these is approximately 50-100ppm (as a sub set of the TDS) and is usually expressed as ppm of CaCO3 (mg/L). Alkalinity of water is the capacity to neutralize acid and is often also expressed as CaCO3. Hydroxides, carbonates and bicarbonates are common sources of alkalinity, and should not be above ~60ppm.

pH Adjustment
It's important that the pH is not above 7.5 nor below 7.0. Most city water supplies process water for safety in ways that can negatively affect its use for coffee and equipment used for brewing, especially espresso machinery. pH adjustment is included for corrosion control. Moving the pH to something greater than 7.0 minimizes the leaching of lead and copper from delivery piping and home plumbing systems, the primary source of lead and copper at the tap. City water systems add Potassium Hydroxide or Sodium Hydroxide, which, when combined with the naturally occurring alkalinity, hardness and dissolved minerals in the water minimizes the leaching of lead and copper into potable water.

Chlorine and Chlorimination
This process is used to disinfect water, and is provided at levels that will leave residual taste defects easily detectable by both taste and smell. Carbon block filters do a good job eliminating this defect, but the cartridges must be changed regularly. Install a gallon flow meter along with your sediment and carbon block filters, and log the dates and water volume used, so that they can be changed at the required frequency. Write the dates and meter readings directly on the cartridges to prevent missed replacement cycles.

Saturation Index (SI)
A positive SI will cause hard minerals to precipitate out of solution, and appear as crystallized deposits on espresso boilers, taps, other plumbing and inside the boilers. Changing the water in the steam boiler once per week can eliminate the water reaching higher concentrations of dissolved solids that greatly accelerate this buildup. If the machine is a single boiler machine, frequent water changes will greatly prolong their useful like. Some espresso machines have an automatic process for purging the water and replacing with fresh water (Dalla Corte and Nuova Simonelli). All machines *should* have an automated process that uses the on-board µprocessor and drain to manage the process without the need to manual intervention. Buildup in the group boiler (of multi-boiler machines) is slower and can be dissolved using a mild acid de-scaling powder once per year or as needed if mineral content is too high.

If the SI is negative, there will not be precipitation of hard minerals, but the water will be corrosive, and may eventually etch the sheathing away from the heating boiler elements, which can be accelerated further due to the effect electrolysis.

Some water supplies vary between a positive SI (summer) and negative one (winter), which is partially dependent on reservoir temperature variations throughout the year.

SI is complex to measure and compute, and is usually published periodically by the LAB contracted by the city water supply authority, and there’s not much you can do about it, but it’s important to know what it is, so that you can treat the water and maintain your machinery accordingly. In some cases, reverse osmosis and mineral re-introduction may be the only option.

