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## On The Table #13

### Engineered Mediocrity Part I - Measuring Your Brewing Water Temperature

Dear cyber reader, Great News! With modern measurement equipment it is easy to monitor the temperature of your espresso machine as you brew a shot. Now for the not so great news. The best machines on the market have a variation in this critical parameter of +/- 3 degrees Fahrenheit during brewing, equal to a six degree range of accuracy. The worst machines in this regard, (95% of the machines sold worldwide) are so unstable their range of accuracy is fourteen degrees. But the coffee itself is sensitive to changes in the brewing water temperature as small as 2/10th of a degree.



**Fig. 1:** Working with equipment such as you see above I have concluded our espresso coffee tastes best at 203.5 degrees F.

Working with equipment such as you see here (**Fig. 1**) I have concluded that our espresso coffee, coffee roasted to a deep mahogany brown with no oils visible on the surface, tastes best at 203.5 degrees F This temperature when held stable to a tenth of a degree either way, produces espresso coffee that is aggressively sweet. In addition this temperature yields the greatest volume of red-brown crema in the cup, given a constant quantity of ground coffee. Taller thicker espressos that taste sweet in the cup.

To arrive at your own best brewing temperature range taste the espresso you are brewing with your temperature probe in place. My speculation is that 203.5 is a universal ideal brewing temperature because it preserves the greatest amount of roasted coffees natural caramelized sugars through the brewing cycle.

The barista has very little control over this factor. Your coffee is being knuckled -under by outdated technology. We need to raise our voices to break this cult of enforced mediocrity. Espresso machine companies are driven to innovate, understandably, only by market demand.

## Measuring Temperature at the Head

You will need a digital thermometer with a K-type bead probe such as the one pictured in **Fig. 2**. This is a Fluke (Tele: 425.347.6100) K/J digital thermometer and sells for about \$150.00. You will also need a drill with a 5/64" drill bit.

To create your measurement rig simply drill a hole just large enough to admit the probe wire in the bottom of a coffee brewing basket. Run the wire up the pour spout of the porta-filter handle, through the hole you drilled in the basket and snap the basket into place. The wire should protrude no more than 3/8" above the bottom of the coffee basket. Now lock the porta-filter into the group head of the espresso machine you would like to test and let it heat up for about 15 minutes.

After the porta-filter has heated up thoroughly in the group head grind a shot and pack it over and around the bead probe. It is crucial that the bead just shows on top of the packed coffee. If the bead is sticking up too high it may contact the metal dispersion screen and create an erroneous reading. If it is buried inside the packed coffee it will take 10 to 15 seconds to obtain a true reading of what the machine is doing as brewing water permeates the packed coffee.



**Fig. 2:** To create your measurement rig simply drill a hole just large enough to admit the probe wire in the bottom of a coffee brewing basket. Run the wire up the pour spout of the porta-filter handle, through the hole you drilled in the basket and snap the basket into place.



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OK your ready. Lock the porta-filter, outfitted with our probe into your espresso machine. Activate the pump and read the temperature of your brewing water on the digital display. It is best to make shots continuously for 15 minutes, one per minute is a good pace, to get a true representation of what your machine is doing on the bar. Each shot should be drawn for 25 to 30 seconds and be of the same volume you would normally serve. That is, if you serve double Ristretto (16 grams of ground coffee, extracted during a brew cycle of 25 seconds yielding 1.5 ounces of crema in the cup for example), be sure to keep your grind and dosage constant to produce the same result. Do not push too much water through the coffee as it will affect your machine's thermal performance. You will be surprised by what your thermometer tells you.

## Recording Your Readings

I recommend you get the Fluke meter and have a friend write down the readings every 5 seconds during your test.

If you prefer you can purchase an ExTech (Tele: 617.890.7440) datalogging multimeter such as the one in the second photograph and have your computer record the data in one second intervals. The advantage is that the data can be graphed or made into bar charts for easy analysis using a spread-sheet program such as MS Excel. The disadvantage is that the ExTech stuff will not allow you to monitor 1/10th of a degree in the desired range.

## **Calibration**

To insure a basic accuracy simply put your bead probe into boiling water, at sea-level this will be close to 212 degrees F.. On the Fluke there is an offset screw to adjust the display to the known standard. If you are not at sea-level you will need a lab standard mercury thermometer, available at any scientific supply house, to compare to.

Each time you use a new probe you will need to adjust the display as each probe is slightly different in it's impedance. Thus, once you have calibrated your display for a probe, be sure to always use the same probe.

## **Tricks and Traps**

It is best to use really fresh coffee in your rig because the oils will help seal the probe wire into the packed coffee. If you crack the coffee pack around the wire hot water will gush out all over your shoes and pants. This may negatively affect your ability to appear cool and all knowing during your test. I pack the coffee and sort of press my finger into it to uncover the bead probe.

Keep your thermometer readout in a plastic bag while testing in case of blow-out, as per the above.

Ciao for now!

## **[Part II](#)**

**END**