

How hot is your shot?

We at Synesso are often asked "How can I tell if my machine is at the right temperature?" The answer is more complex than you might think. Several important concepts factor into both the temperature you read on your machine and the set point you should choose.

The first major factor in temperature is the machine itself. Many people hold the belief that PID control automatically equates to accurate temperature at the puck. In practice, what you get with PID control is a machine capable of being much more precise than one without such. Accuracy is defined as coming as close as possible to a known standard. In this case, the temperature you might read from a calibrated external thermometer. Precision is defined as coming as close as possible to a pattern. In this case, a stable and repeatable temperature.

Why should we care more about precision than accuracy? The short answer is that there are temperature probes inside the machine, but not inside your puck. As water is dispensed, it loses heat energy to parts of the machine, the screen, the screw, the puck itself, even the portafilter and basket. We have designed our tanks and temperature probes to provide the best thermal information available to the PID controller, but after the water leaves the tank, the water is pretty much on its own. The only way to tell how much heat energy has been lost to the system is to measure the temperature of the water when it is actually inside the puck. Here at the Synesso factory, we use a specially modified portafilter, a tiny bead probe, and a trusted brand of meter to measure that in-puck temperature. Since our machines are designed to be very precise, we can then just adjust the displayed temperature to reflect what you will actually receive on your puck. We call this adjustment between tank temperature and puck temperature an offset. Offsets translate our precision to accuracy. Imprecise machines will not be able to settle on an offset as each shot will provide a different puck temperature. Imprecision makes accuracy impossible.

The exact procedure Synesso uses to determine the offset is as follows:

Using a bottomless portafilter, dose out 16-18 grams of coffee into a 14 gram basket with a thermal probe inserted 1/8th of an inch from the surface and in the middle of the puck. Pack and tamp the grounds in the basket as usual. The thermal probe is then wired to a FLUKE thermometer to measure the actual temperature of the water flowing through the puck while pouring a 2 ounce, 25 second shot. Temperatures measured for the first and last 5 seconds of the shot are discarded. The remaining 15 seconds are averaged together. This process is repeated a minimum of 3 times per brew group in order to get the most accurate readings.

Some of our customers have purchased or recreated measurement tools similar to ours. There are also espresso machine calibration tools on the market. The key to using any of these is to develop a simple, consistent procedure which allows you to repeat the testing at any time, at any location, eliminating all variables except temperature, which you then measure. Keep in mind that different procedures will produce different temperature test results, likely resulting in different offsets than Synesso originally programmed into your machine. This is not an error. As long as your procedure produces consistent, high precision results, it is a valid procedure. Keep in mind that procedures that are closer to the act of actually extracting espresso will result in more accurate offsets.

Remember, thermal accuracy is obtained through high precision and careful offset calibration.