WORLD COFFEE EVENTS

ESPRESSO MACHINE TESTING AND EVALUATION

2017

Contents

World Coffee Events

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Introduction

The purpose of espresso machine testing is to ascertain that candidate espresso machines meet minimum performance criteria, and to assess the suitability of these machines for use as competition espresso machines within the system of world, national, and regional competitions, including World Barista Championship (WBC), World Latte Art Championship, and World Coffee in Good Spirits Championship. This document provides information related to the type of machine being solicited for WCE use, installation in the testing environment, required manufacturer support during the tests, and information about the tests themselves. Testing is performed by an ad-hoc committee convened by the WCE Board of Directors. All references to WBC rules refer to the 2017 WBC Rules and Regulations, version.

1. Espresso Machine Requirements

1.1 Configuration

Espresso machines are to be 3-group, semi-automatic espresso machines, equipped with two non-automated steam wands, one near each end of the espresso machine, and a hot water spigot. By semi-automatic, we mean that brewing is initiated and terminated manually, by human actuation of a mechanical or electro-mechanical device, such as a push-button. Electronic volumetric or timed control of espresso brewing is not allowed. By non-automated steam wand, we mean that steaming is initiated and terminated manually, by human actuation of a mechanical or electro-mechanical device, such as an actuation lever, knob, or foot pedal.

1.2 Water Supply Information

During testing, the espresso machine will draw brewing/steaming water from a bottled water supply, and discharge waste water to a drain bucket. The chemical makeup of the water shall conform to SCAA/SCAE standards for water quality.

1.3 Electrical Supply Information

The electrical supply at the test site is 230V 50Hz.

1.4 Portafilters

Five portafilters shall be supplied, of which three shall be supplied with double-spouts and two shall be modified such that the floor of the portafilter is machined away (bottomless configuration). The inside diameter of the bored-out floor should be the same as that of the portafilter body. These two portafilters

will be used for quantitative temperature and pressure testing. Portafilters as provided on the submitted machines shall have as internal depth sufficient to house a filter with 20g nominal capacity.

1.5 Filter Baskets

Candidate machine manufacturers shall equip their machines with filter baskets with a nominal capacity of 20g ± 1g of coffee ground for espresso, the value typically used in WCE competitions. Adequate headroom above the dose should be provided such that when the portafilter with basket and 20g dose is mounted to the group assembly, the top of the tamped coffee bed is not disturbed.

2. Manufacturer Requirements and Responsibilities

2.1 Group Size and Filter Baskets

The nominal diameter of the portafilters (e.g., 58mm, 57mm, 54mm, etc.) shall be disclosed and delivered to the WCE testing committee by March 1st, 2017 to make sure that suitable testing fixtures are available for use during the WCE testing event. Candidate machine manufacturers submitting espresso machines using filter baskets with diameters other than 58mm shall supply 4 filter baskets for the construction of testing fixtures, with basket depth of 27mm if possible, to Gregory Scace, Espresso Research, LLC, 22304 Rolling Hill Lane, Laytonsville, MD 20882, USA.

Please note that this facility does not have a receptionist, and manufacturers are recommended to send packages that do not require a signature. Deadline for receipt is April 1st, 2017.

2.2 Submission of Filter Baskets for Dimensional Testing

Each manufacturer shall submit an additional 30 filter baskets for a series of dimensional consistency measurements that will be performed prior to the WCE testing event. The filter baskets shall be identical to the type that will be used by the candidate espresso machine, and will have a nominal capacity of 20 +/- 1-grams coffee ground for espresso, the value typically used in WCE competitions. ***Each filter basket shall be marked with the applicant Company name (or abbreviated initials) and sample number: 01-30.*** The baskets shall be shipped to Vincent Fedele, FedEx Copy & Print Center, A-160, 750 Stony Point Rd. Santa Rosa, CA 95407. The deadline for receipt is March 15th, 2017.

Please note that neither facility mentioned above in 2.1 and 2.2, has a receptionist, and manufacturers are recommended to send packages that do not require a signature.

2.3 Installation

The manufacturer is responsible for installing the machine prior to the tests, and insuring that the machine performs to the manufacturer's satisfaction. The manufacturer (or its agent) shall supply and install all necessary equipment to connect the espresso machine to the water source and drain, including pumps required to meet the espresso machine's inlet pressure requirement, accumulator tanks, all tubing and fittings.

2.4 Operation/Maintenance/Repair

It is the manufacturer's responsibility to ensure that the espresso machine's operational parameters are within the WBC rules and specifications of these tests, and that the machine operates as expected by the manufacturer. The manufacturer is responsible for maintenance and repair of its espresso machine during the tests. This includes the equipment required to meet 2.1.

2.5 Machine Removal

Manufacturers shall be responsible for draining, decommissioning, packing, and transporting their machinery after testing is concluded, and shall supply all required equipment and personnel for this purpose.

Testing and Evaluation

Overview

The quantitative testing phase is designed to ensure that candidate machines are adjustable to WBC-specified brewing temperature and pressure specifications, and that they meet reasonable standards for repeatability. Although candidate machines must meet or exceed the quantitative test threshold values in order to be considered for WCE sponsorship, qualitative testing will still be performed in order for all test participants to learn as much as possible from this unique opportunity.

3.1 Preparation for Testing

Prior to quantitative and qualitative testing, the manufacturer shall ensure that its candidate espresso machine is adjusted such that temperature and pressure fall within the values specified in the WBC Official Rules and Regulations.

3.2 Adjustment during Testing

Adjustments to temperature and pressure during a machine's quantitative temperature and pressure testing are only allowed per the testing requirements, or with the permission of the testing committee chair and consensus of the testing committee. Adjustments are permitted during the qualitative phase of testing, provided that the adjusted temperature / pressure are within the specifications outline in the current WBC rules.

3.3 Access to Internal Components

The manufacturer's designated service personnel shall provide access to internal components of the respective candidate espresso machines as requested by members of the testing committee

3.4 Quantitative Temperature Testing

Tests shall be performed per the 2017 WCE Procedure for the Measurement of Brewing Water Temperature in Espresso Machines. Tests will be performed on multiple groups operating

simultaneously, including groups 1 and 2, 1 and 3, 2 and 3. Response to step changes in temperature will be measured. An arbitrary pair of groups may be retested with simultaneous steam actuation.

3.5 Quantitative Pressure Testing

Pressure measurement shall be performed at the groups, under the flow conditions specified in the 2017 WCE Procedure for the Measurement of Brewing Water Temperature in Espresso Machines. Measurements will be obtained on each individually operating group, and on pairs of simultaneously operating groups (groups 1 and 2, 1 and 3, 2 and 3). The maximum allowable difference between the highest and lowest of the 9 pressure values is 0.4 bar (6 pounds per square inch).

3.6 Filter Basket Consistency Testing

A sample of 30 filter baskets, submitted per section 2.2, will be measured for dimensional consistency using a digital filter imaging system developed for this purpose. We will examine the consistency in dimensional uniformity of the baskets provided. Data of all measurements will be shared anonymously with each applicant. Filters submitted will be sorted with respect to total open area and dimensional uniformity of hole size distribution. Of the 30 submitted baskets, 28 must meet the following specifications:

a) **Range of Total Open Area** - The total open area of all 28 samples must fall within 90% to 110% of the average total open area of the 28 baskets, e.g., AVG Total Open Area +/- 10% (e.g. If the AVG Total Open Area is 40 sq mm, then all baskets should fall within a 20% range of 36.0 - 44.0 sq mm (i.e., 40 +/- 4 sq mm)).

b) **Range of hole sizes** - 95% of holes shall have effective diameters that fall within a range of 100µm (Note: Because some methods do not produce circular holes the imaging system assigns an effective diameter based on the measured hole area). Requirement (b) is intended to provide a limit on the non-uniformity of hole sizes within a filter.

c) **Other requirements** - No more than 1% of holes can be blocked.

d) **Extraction Testing** - Two randomly selected baskets will be forwarded to the machine test site for extraction testing. At the test site, a series of extractions will be pulled at brewing ratios (the ratio of the weight of ground coffee to weight of brewed espresso) between 50 and 80%. These values bracket the brewing ratios typically seen in WCE competitions. At the testing site, we will determine the percent concentration and extraction yield by plotting measurements obtained with a coffee refractometer on a brewing control chart. The filters and machine combination must be capable of extractions that fall within 9-15% concentration and 18-22% extraction yield.

3.7 Qualitative Testing

Espresso machines will be qualitatively evaluated by teams assembled from members of the WCE Qualified Testing Committee. The general topics covered under this evaluation are contained in the 2017 WCE Qualitative Espresso Machine Evaluation Test Form. Testers shall qualitatively score the espresso machines in each category, based on their personal judgement, and the judgement of the test team(s). Scoring levels and weight are outlined in the test form.

3.8 Disqualification during Qualitative Testing

The testing committee may disqualify a candidate machine that exhibits significant technical issues that would, in the opinion of the testing committee, make the machine unsuitable for WCE competitions. Such issues might include the failure of controls to perform reliably, or an uncovered usability issue not detected in quantitative testing, such as a gross change in pressure ramping when operating multiple groups compared to one group.

3.9 Ranking of Results

All espresso machines passing the quantitative requirements and not disqualified under 3.8 are eligible for WCE sponsorship consideration. The score applied during qualitative testing will be used to rank eligible machines for desirability as the next WCE competition machine. This ranking is the opinion of the testing committee as to fitness for competition use and does not select the next WCE competition machines.

3.10 Confidentiality of Results

Results may be discussed among members of the testing committee, but committee members may not discuss results publicly at any time. Manufacturers are entitled to a copy of their respective results only. Manufacturers are free to discuss their individual results as they see fit.