

DRAFT: Global LEAP Electric Pressure
Cooker Laboratory Test Method
Summary

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1 Scope

This document defines methods to evaluate the quality, performance, and safety of electric pressure cookers (EPC) in a laboratory. This test method applies to AC and DC EPCs with capacity (volume) up to 25L. An EPC is defined as electric-powered cookware with an integrated heating source and a removable lid designed specifically for cooking food with water or steam under pressure.

The test method consists of the following major components:

- Overall product quality inspection, both internal and external as well as an evaluation of the user manual and manufacturer provided information
- Evaluation of performance, including cooking time, temperature consistency, and energy efficiency during pressure and sauté cooking modes
- Evaluation of safety

The following international test procedures have been referenced in the preparation of this document:

- BS EN 12778:2002 // British Standard: Cookware – Pressure cookers for domestic use
- IEC 60335-2-15 // Household and similar electrical appliances – Safety – Part 2-15: Particular requirements for appliances for heating liquids
- IEC 61817 (1:2004) // Household portable appliances for cooking, grilling and similar use – Methods for measuring performance
- Water Boiling Test v. 4.2.3 (March 2014, Global Alliance for Clean Cookstoves)
- Cookstove Durability Protocol (March 2014, Global Alliance for Clean Cookstoves)
- Biomass Stove Safety Protocol Guidelines (Global Alliance for Clean Cookstoves)

2 Test Procedures

Summary

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2.1 Visual Screening

The purpose of this section is to guide the Visual Screening process. The information gathered here will also help inform the Qualitative Assessment (2.2) process.

Each of the following sub-sections (a-f) correspond to physical components of an EPC. For each component, describe the listed features and note the source of information (user manual, product packaging, engraving on component, metal plate fastened on component, easily removable sticker on component, or manufacturer provided documentation) in the test report.

- a) External Photographs
- b) General Information
- c) Documentation
- d) User or Operation Manual
- e) Warranty
- f) Components list TBD
 - i. Component features TBD

2.2 Qualitative Assessment

The purpose of this section is to guide the Qualitative Assessment process based on inputs from the Visual Screening (2.1) process. The outputs of the Qualitative Assessment section represent the laboratory's high-level evaluation of an EPC's overall build and material quality, as well as its operating manual and warranty documents.

Provide a rating (good, satisfactory, needs improvement, poor) for the following categories:

- a) External inspection of overall quality and maintainability of materials and surfaces
 - i. Note any deficiencies
 - ii. Rating scale:
 - Good – No workmanship or functionality deficiencies were observed.
 - Satisfactory – Small workmanship deficiencies were observed such as scratches, missing screws, or small deformities, but these issues did not affect functionality of the product.

- Needs improvement – Many workmanship issues were observed such as scratches, missing screws, or small deformities, that did not affect the overall functionality of the product or small functionality issues were observed.
- Poor – Many workmanship issues were observed that affected the overall functionality or safety of the product.
- b) Internal inspection of overall quality and durability of materials and components
 - i. Note any deficiencies
 - ii. Rating scale TBD
- c) User or Operation Manual
 - i. Note any deficiencies
 - ii. Rating scale TBD
- d) Warranty
 - i. Note any deficiencies
 - ii. Rating scale:
 - Good – Warranty clearly states what is covered, the length of the warranty, and how to access the warranty.
 - Satisfactory – Warranty states what is covered and the length, but how to access the warranty is missing.
 - Needs improvement – A warranty is provided, but there is conflicting information on either what is covered, the length, or how to access it.

2.3 Pressurization Test

The Pressurization Test measures an EPC's performance during the first phase of cooking, when the device is filled with a payload, set to pressure cooking mode, and contents begin heating up and pressurizing.

- a) Procedure
 - i. Fill chamber to 50% rated capacity with standardized water, set to high pressure mode, allow to reach max temperature.
 - ii. Repeat test using standardized food substance instead of water.
 - iii. Repeat test using low volume (1L) of standardized water.
 - iv. Repeat test using high volume (80% capacity) of standardized water.
 - v. Repeat test under low voltage condition.
 - vi. Repeat test under high voltage condition.
- b) Calculate & Report
 - i. Measured temperature change over time (°C% CV)
 - ii. Measured temperature differences within the cooking chamber area (°C% CV)
 - iii. Time to reach max cooking temp (min/kg)
 - iv. Energy consumption pattern (Wh)
 - v. Energy consumption per payload (Wh/kg)
 - vi. Maximum power draw (W)

- vii. Energy efficiency (%)

2.4 Pressure Cooking Test

The Pressure Cooking Test measures an EPC's performance during the second phase of cooking, once the contents of the device have reached a stable maximum temperature and pressure.

- a) Procedure
 - i. Once EPC contents have reached stable maximum temperature and pressure for 5 minutes (from 2.3 Pressurization Test), allow EPC to maintain pressurized cooking at level temperature for 45 minutes.
 - ii. Repeat test using standardized food substance instead of water.
 - iii. Repeat test using low volume (1L) of standardized water.
 - iv. Repeat test using high volume (80% capacity) of standardized water.
 - v. Repeat test under low voltage condition.
 - vi. Repeat test under high voltage condition.
- b) Calculate & Report
 - i. Measured temperature change over time (°C% CV)
 - ii. Measured temperature differences within the cooking chamber area (°C% CV)
 - iii. Energy consumption pattern (Wh)
 - iv. Energy consumption per payload (Wh/kg)
 - v. Maximum power draw (W)
 - vi. Energy efficiency (%)

2.5 Pressurization Test – Hot Start

The Pressurization Test – Hot Start measures an EPC's performance during the first phase of cooking, when the device is filled with a payload, set to pressure cooking mode, and contents begin heating up and pressurizing. However, this is done using a "hot" EPC: one that was recently operating with a payload in pressure cooking mode for at least 45 minutes.

- a) Procedure
 - i. Repeat 2.3 Pressurization Test exactly 3-minutes after the test ends.
- b) Calculate & Report
 - i. Measured temperature change over time (°C% CV)
 - ii. Measured temperature differences within the cooking chamber area (°C% CV)
 - iii. Energy consumption pattern (Wh)
 - iv. Energy consumption per payload (Wh/kg)
 - v. Maximum power draw (W)
 - vi. Energy efficiency (%)

2.6 Sauté Cooking Test

The Sauté Cooking Test measures an EPC's performance during the sauté cooking mode, when the device is filled with a small amount of oil.

- a) Procedure
 - i. Fill EPC with 0.1L of standardized oil, set to sauté/fry cooking mode, lid off, allow to cook for 45 minutes.
- b) Calculate & Report
 - i. Measured temperature change over time (°C% CV)
 - ii. Measured temperature differences across the cooking surface area (°C% CV)
 - iii. Energy consumption pattern (Wh)
 - iv. Maximum power draw (W)

2.7 Tipping Test

- a) Procedure
 - i. Fill EPC to 90% capacity with water and place on a flat surface. Slowly raise one side until the EPC freely tips over or onto another side.
- b) Calculate & Report
 - i. Angle at which the device tips over (°)

2.8 External Temperature Test

- a) Procedure
 - i. Fill chamber to 50% rated capacity with standardized water, set to high pressure mode, allow to reach max temperature.
 - i. Measure the temperature of all external surfaces.
- b) Calculate & Report
 - i. Location of highest temperature
 - ii. Highest temperature reached (°C)
 - iii. Pass/fail assessment below/above 60°C

2.9 Workmanship & Materials Tests

- a) Procedure
 - i. Assess physical and mechanical functionality of handles/lifting grips (of body and lid).
 - ii. Assess cooking material coating.
- b) Calculate & Report
 - i. Pass/fail for each procedure
 - ii. Description if fail

2.10 Control & Safety Device Tests

- a) Procedure
 - i. Assess pressure control device functionality.
 - ii. Assess pressure indicator functionality.
 - iii. Assess safety device functionality.
 - iv. Assess safe opening system functionality.
- b) Calculate & Report
 - i. Pass/fail for each procedure
 - ii. Description if fail

2.11 Pressure Resistance Tests

- a) Procedure
 - i. Prevent pressure control and safety devices from functioning, fill chamber to 50% capacity with water, close lid, attempt to increase pressure inside chamber as high as possible.
- b) Calculate & Report
 - i. Pass/fail based on TBD criteria

2.12 Drop Test

- a) Procedure
 - i. TBD
- b) Calculate & Report
 - i. Pass/fail based on TBD criteria

2.13 Circuity & Wiring Durability Tests

- a) Procedure
 - i. Assess under- and over-voltage resilience.
 - ii. Assess temperature and usage resilience.
 - iii. Assess maximum current in fuse.
 - iv. Assess carrying capacity of cables.
 - v. Assess leakage current.
- b) Calculate & Report
 - i. Pass/fail for each procedure