



# Test procedures, measurements and standards for cooking stoves and ovens

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# 1. Test procedures, measurements and standards

As technology and designs for cooking stoves vary largely across the world, many different test standards have been developed and harmonisation is urgently needed. According to the Collaborative Labelling and Appliance Standards Program (CLASP) “...cooking appliances are not a good candidate for harmonisation at this time.” (CLASP 2011). Therefore, many test procedures are rather country-specific and are used for comparison between tested products in this particular case, but cannot be seen as a possible international standard. However, tests can be grouped under a few different categories.

## 1.1 Biomass cooking stoves

With regard to biomass cooking stoves, test procedures vary extremely and there are no established performance criteria (WHO 2008). There are several different methods to measure the performance of biomass cooking stoves. These different methods are used according to the resources available and in order to obtain different sets of data. Most test procedures boil a certain amount of water and measure biomass inputs and the required time to fulfil the task (MacCarty et al. 2008). Other test procedures try to measure and compare the energy efficiency of different stoves by relating to local dishes. One study measures wood inputs for the quantity of food, which is cooked by representative households in order to compare different stove designs (Edwin Adkins et al. 2010). The main four tests are thus the water boiling test, the controlled cooking test, kitchen performance test, and the emission control test. Standardisation is under way and has been implemented in, for example, the water-boiling test in Lima in 2011 (see PCIA 2013).

## 1.2 Electric and gas cooking stoves

Concerning electric and gas cooking hobs, although several standards have been developed to measure performance and safety of different appliances, adequate test procedures remain a problem. A European test standard for gas burners (EN 203-2-1:2005) tests gas heating efficiency by heating pans of water to 70 degree Celsius whilst set at their maximum burner level. Another test (EN 50304:201), which applies to electric hobs, includes performance tests and uses the heating up of water as a measure for energy consumption. But the test procedure is described as; inaccurate (EC 2011a). In a test by the German magazine - Stiftung Warentest in 2004, the testers applied a test procedure for hobs, which used a pre-defined pan/pot, which in one test heated 1.5 litres of water without a lid from 15 to 90 degrees Celsius, and in another test heated lentil soup (600g) from the refrigerator up to 80 degrees Celsius and then kept it warm for 45 minutes. The required time and energy consumption in kWh was measured. In the USA, a test procedure for conventional cooking products is under development, that establishes provisions for determining cooking efficiency, which is then defined as a ratio of cooking energy outputs and inputs.

With sophisticated ovens, a commonly used test procedure in Europe and elsewhere is the so-called wet brick test (EN 15181:2009), which aims at measuring the energy consumed during typical cooking. In order to prevent large variations because of differences in the types of foods being cooked, a standard ceramic brick that has absorbed water is used. The temperature of the brick is raised from 5 to 60 degrees Celsius and the energy then used to perform that task is measured. With gas ovens, two other standards exist in Europe, which measure the net volumes in litres and energy consumption of the oven for pre-heating and per test cycle, whereas an empty oven with natural convection (EN 30 2.1) or with forced convection (EN 30 2.2) are used. It must be taken in consideration that results from the tests of gas ovens are given as primary energy input, while results from the testing of electric ovens are mainly indicated as electrical energy use, which makes it difficult to compare the two (EC 2011b).

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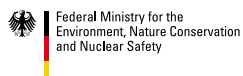
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