

## Energy Efficiency Standard for:

***DRAFT***

## **BOILING PANS**



As recognised by EFCEM National Associations

This is one of a series of standards published by EFCEM covering the key categories of commercial catering equipment.

The standards are published in order to provide an agreed test methodology against which manufacturers can evaluate the energy efficiency of their equipment and declare its efficiency rating as a percentage figure.

## 1 Scope

This efficiency test standard sets out requirements and test methods for measuring and recording the energy used by a gas heated or electrical heated boiling pan.

## 2 Normative references

EN 437  
EN 203-1:2005  
EN 203-2-4  
EN 13886  
EN 1717  
EN 60335-1  
EN 60335-2-47

EN 203-1:200X: Gas Heated Catering Equipment Part 1 - Safety requirements

pr EN 13886: Food processing machinery- Cooking kettles equipped with stirrer and/or mixer  
- Safety and hygiene requirements

EN 1717: Protection against pollution of potable water in water installations and general requirements of devices to prevent pollution by backflow

## 3 Test room and preparation of the appliance

The ambient temperature of the test room shall be maintained at  $(20 \pm 5) ^\circ\text{C}$ .

The room shall be adequately ventilated but free from draughts likely to affect the performance of the appliance.

The appliance shall be installed and adjusted according to the manufacturer's instructions.

Before proceeding with the tests, the appliance shall be operated at its maximum working temperature at nominal rate for a period sufficient to dry the insulation and remove any temporary finish products that could affect the test procedure.

The appliance shall be at room temperature at the start of the test.

During testing, the initial adjustment of the appliance shall not be altered.

The test pressure shall be measured to correct to within  $\pm 2\%$  and controlled so that the variation does not exceed  $\pm 2\%$

Appliances with regulating or limiting devices shall be tested with those devices at their maximum setting if the setting is intended to be altered by the user.

Appliances requiring a water supply shall be connected to a supply of appropriate pressure and the water level adjusted in accordance with the manufacturer's instructions. If not designed to be connected to a water supply, the water container shall be filled to the indicated level for each test and, when necessary, be maintained at this level during the test.

## **4 Tilting boiling pans**

The kettle shall only be tilted by a voluntary action of the operator. This requirement shall be the same when the kettle is tilted back to its working position.

When actuators are released in any tilting position of the kettle, it shall remain stationary. In the case of a manual control device, it shall be so designed that the tilting motion is controlled during all of its motion.

It shall not be possible to adversely influence the tilting action other than by the intended means.

The kettle shall be self balanced or self locking.

In the case of power operated tilting of the kettle, it shall be achieved by a maintained action control device which shall be situated outside the danger zone, and located where the operator can see clearly the movement of the kettle during the tilting.

The tilting mechanism shall be self-locking to prevent unintended movements of the kettle in every position in case of failure of the power.

Devices controlling the tilting process shall be clearly marked to show the direction of movement.

The control devices shall be located and protected in such a way that they cannot be operated accidentally.

For tilting devices using auxiliary energy, the minimum time for tilting shall be 20 s.

### **4.1 Covers**

Covers shall be constructed in such a way so as to insure that uncontrolled closure does not cause injury to the operator.

### **4.2 Boiling pans fitted with stirrers and/or mixers**

The safety and hygiene requirements and/or measures given in EN 13886 shall be complied with.

Stirrers/mixers which can be moved between adjacent kettles, shall be designed and positioned so as to prevent obstruction of the combustion products evacuation outlet or duct.

### **4.3 Special requirement for tilting boiling pans**

The main burner shall be shut off at the beginning of the tilting action.

### **4.4 Pressurised parts**

Pressurised appliances shall be fitted, in addition of pressure regulator(s), with relief valves of which the calibrated pressure and relief can not be modified.

The relief valve(s) shall be located in such a way to not be a risk in case of opening.

The lockout mechanism(s) of the cover shall be design to prevent any unintended under pressure opening.

It shall not be possible to open the lid or cover of a pressurised appliance until the pressure has been reduced to approximately atmospheric pressure.

Pressurised boiling pan and jackets shall incorporate a vacuum release device to prevent a partial vacuum forming unless they are designed for vacuum operation.

In all cases pressurised boiling pans shall satisfy the pressure tests of 7.8.2 of EN 203-1:2005.

A pressurised boiling pan shall be fitted with a pressure gauge or indicator device.

#### **4.5 Temperature limits**

For this test the boiling pan is filled with water to its nominal level.

### **5 Methodology**

The pan and jacket (if applicable) is filled with a measured quantity of water, to the indicated level stated by the manufacturer, the water being at approximately 15°C.

Tests are carried out with the lid closed.

The temperature of the water is measured at the centre of the pan, 10 cm below the surface of the water. The water is not stirred.

#### **5.1 Gas heated boiling pan**

The test is carried out with one of the reference gas of the category to which the appliance belongs. The burner is adjusted to its nominal rate.

The requirements for test gases are specified in Annex A of EN 437.

The burner is adjusted to its nominal rate.

The burner is ignited and the measurement of time, gas consumption and temperature rise starts when the temperature of the water reaches  $(20 \pm 1)^{\circ}\text{C}$  ( $t_1$ ).

The time and gas consumption required to reach a temperature rise of 70 K are noted.

At the end of the test, after extinction of the burner, the maximum water temperature reached is measured ( $t_2$ )

If boiling point is reached during this test, the test is repeated with a lower rise of temperature.

#### **5.2 Electrical heated boiling pan**

The test is carried out with the electrical supply given by the manufacturer with a tolerance of +/- 5%.

Supply is switched on and the measurement of time, electric consumption and temperature rise starts when the temperature of the water reaches  $(20 \pm 1)^{\circ}\text{C}$  ( $t_1$ ).

The time and electric consumption required to reach a temperature rise of 70 K are noted.

At the end of the test, after extinction of the burner, the maximum water temperature reached is measured ( $t_2$ )

If boiling point is reached during this test, the test is repeated with a lower rise of temperature

## 6 – Efficiency

### 6.1 – Gas heated boiling pan

The efficiency is given by:

$$R = \frac{m C_p (t_2 - t_1) \times 100}{V_c \times H_1}$$

Where:

$R$  is the efficiency, in per cent;

$m$  is the mass of water in kilograms;

$C_p$  is the specific heat of water [ 4,186 x 10<sup>-3</sup> MJ/(kg.K)];

$t_1$  is the initial water temperature in degrees Celsius;

$t_2$  is the final water temperature in degrees Celsius;

$V_c$  is the volume or mass of gas burned in cubic metres or kilograms;

$H_1$  is the net calorific value of the gas in megajoules per cubic metre or megajoules per kilogram (kilocalories per cubic metre).

The volume of the gas consumed determined from the volume measured is given by:

$$V_c = V_{mes} \times \frac{p_a + p - p_s \times \frac{288,15}{273,15 + t_g}}{1013,25}$$

where:

$V_{mes}$  is the volume of gas measured in cubic metres;

$p_a$  is the atmospheric pressure in millibars;

$p$  is the supply pressure of the gas at the point of measurement of the heat input in millibars;

$p_s$  is the partial pressure of water vapour in millibars (as defined in 7.3.2.1 of EN 203-1:200X);

$t_g$  is the temperature of gas at the point of measurement

### 6.2 – Electric heated boiling pan

The efficiency is given by

$$R = m \times C_p \times \frac{(t_1 - t_2)}{E} \times 100$$

Where:

$R$  is the efficiency, in per cent;



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$m$  is the mass of water in kilograms;

$C_p$  is the specific heat of water [  $4,186 \times 10^{-3} \text{ MJ}/(\text{kg.K})$ ];

$t_1$  is the initial water temperature in degrees Celsius;

$t_2$  is the final water temperature in degrees Celsius;

$E$  is the energy consumption.

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