NOTE EN 30-1-2:2012, 7.3.3.1.5 gives additional testing criteria appropriate to appliances having forced-convection ovens and/or grills.

7.3.3.1.6 Operation of the building-in unit door

EN 30-1-1:2008+A2:2010, 7.3.3.1.6 shall apply to burners not equipped with an automatic burner control system.

7.3.3.1.7 Grill in the oven compartment

EN 30-1-1:2008+A2:2010, 7.3.3.1.7 shall apply to burners not equipped with an automatic burner control system.

7.3.3.1.8 High level grill

EN 30-1-1:2008+A2:2010, 7.3.3.1.8 shall apply to burners not equipped with an automatic burner control system.

7.3.3.1.9 Influence between two ovens or grills

EN 30-1-1:2008+A2:2010, 7.3.3.1.9 shall apply to burners not equipped with an automatic burner control system.

NOTE EN 30-1-2:2012, 7.3.3.1.9 gives additional testing criteria appropriate to appliances having forced-convection ovens and/or grills.

7.3.3.1.10 Built-in ovens

EN 30-1-1:2008+A2:2010, 7.3.3.1.10 shall apply to burners not equipped with an automatic burner control system.

7.3.3.2 Combustion

EN 30-1-1:2008+A2:2010, 7.3.3.2 shall apply to burners not equipped with an automatic burner control system.

If a test requires the operation of one or more burners under cyclic (on-off or high-low) control during the test, the CO and CO_2 concentrations of the sample are monitored continuously for a sufficient period to appreciate any fluctuations in their concentrations. This data is used to plot curves of the CO and CO_2 concentrations against time, in order to determine their mean concentrations in unit time.

NOTE EN 30-1-2:2012, 7.3.3.2 gives additional testing criteria appropriate to appliances having forced-convection ovens and/or grills.

7.4 Verification of the constructional requirements specific to parts of the appliance having burners with an automatic burner control system

7.4.1 Accumulation of un-burnt gas in the appliance

7.4.1.1 Examination of the construction

The requirements of 5.3.8 shall be checked in the first instance by examining the appliance construction and that of its controls in order to determine the circumstances under which un-burnt gas can be admitted to the appliance where, after some delay, it could be ignited by any source of ignition on the appliance.

During the examination of the appliance, a number of factors shall be taken into consideration. These factors are given in the Table 4:

Table 4 — Factors to be taken into consideration for testing the safety of burners in the appliance

Item	Factors
a)	The possibility that controls may be operated incorrectly or out of sequence [a]
b)	The possibility of ignition by means of some other ignition source on the appliance, e.g. via flue duct [b]
c)	Interruption and restoration of the electrical supply
d)	Failure of a clock, timer or programmer
e)	The reaction of the control system in the event of controlled shut-down or safety shut-down and, in particular, whether the control system initiates automatic recycling or ignition energy restoration in these circumstances.
f)	The circumstances, if any, in which a pre-purge is carried out.
[a] This factor is considered when the user is required to carry out several manual actions when putting the burner into operation e.g. when using an oven for automatic cooking. In such cases, the examination ensures that accidental mistakes or omissions when carrying out these actions would not create a dangerous accumulation of un-burnt gas in the appliance (see also 7.4.2). [b] This factor includes the possibility of ignition resulting from operation of an electric grill in the same compartment.	

If, after this examination, delayed ignition of a potentially dangerous accumulation of gas is not possible, the requirements of 5.3.8 are deemed to be satisfied.

NOTE If any accumulation of gas would create conditions that are less severe than those achieved in 7.5.2.1.4 or 7.5.3.1.11, as appropriate, the requirements of 5.3.8 are deemed to be satisfied and the following test is unnecessary.

7.4.1.2 Test

If, after the examination of 7.4.1.1, a delayed ignition of a potentially dangerous accumulation of gas seems possible, the following test is carried out using the reference gas or gases at the normal test pressure.

The circumstances giving rise to the potentially dangerous accumulation of gas are established and the ignition device or any other means of ignition is operated after a short delay. At the end of this test, the gas supply to the burner is interrupted, the compartment is ventilated and the appliance cooled to room temperature.

The test is repeated several times, gradually increasing the delay until the most critical delay is reached. After each ignition test the compartment is ventilated and the appliance is cooled to room temperature.

The requirements of 5.3.8 are deemed satisfied if, on reaching the most critical delay:

— there is no damage to or distortion of the appliance;

— the compartment door, if any, does not open itself;

— no flame is emitted from the front of the appliance.

However, if at any time during the delayed ignition tests, one of the above phenomena is observed, the tests are halted and the appliance is deemed not to comply with the requirements of 5.3.8.

For these tests, devices for remotely controlling the ignition and the gas supply to the burner shall be used.

7.4.2 Manually operated devices (see 5.4.1)

The appliance is installed as described in 7.1.4.2 and supplied with an appropriate reference gas (see 7.1.2.1).

Each burner having an automatic burner control system is adjusted to its nominal heat input in accordance with 7.1.4.1.3 and tested separately as follows. The start/stop devices are manually operated on and off 10 times i.e. one operation every 5 s.

7.4.3 Safety times

7.4.3.1 Safety time (see 5.4.2.1.2, 5.4.2.1.3, 5.4.2.2.2, 5.4.3.2.3, 5.4.3.2.4 and 5.4.3.3.2)

This test is carried out for each burner having an automatic burner control system.

Isolate the gas supply to the burner concerned. Attempt to light the burner in accordance with the manufacturer's instructions, and measure the time interval between the signal to open the automatic shut-off valve(s) and the signal to close the valve(s) in the event of failure to ignite.

Compare this time with the maximum safety time declared by the manufacturer.

NOTE This test is independent of the temperature of the burner; one test is sufficient.

7.4.3.2 Extinction safety time (see 5.4.2.1.1, 5.4.2.2.1, 5.4.3.2.2 and 5.4.3.3.1)

Each burner having an automatic burner control system is adjusted to its nominal heat input in accordance with 7.1.4.1.3 and tested separately as follows.

With the burner control system in the running condition, isolate the gas supply to the burner. Measure the time interval between when the burner flames are extinguished and the signal to close the automatic shut-off valve(s) is given. It is checked that this time does not exceed those specified in 5.4.2.1.1, 5.4.2.2.1, 5.4.3.2.2 and 5.4.3.3.1 as appropriate.

If the burner has a flame supervision device that is heat sensitive, this test is carried out at the end of Test no. 2 of 7.5.2.2.1 for hotplate burners or, for oven and grill burners, the tests in 7.5.3.2.2 that require the use of reference gases. When, following isolation of the gas supply, the burner flames have been extinguished, the gas supply to the burner is restored.

7.4.4 Appliances incorporating a hotplate having touch controls

The appliance is installed and adjusted as described in 7.1.

The test is carried out with each hotplate burner or electric cooking plate in operation in turn and then without any hotplate burner or electric cooking plate in operation.

Sufficient water to completely cover the control panel to a depth not exceeding 2 mm, with a maximum of 140 ml, is poured steadily over the control panel so that bridging occurs between combinations of touch pads.

A cloth having a mass between 140 g/m^2 and 170 g/m^2 and dimensions of 400 mm by 400 mm is saturated with water and folded four times into a square pad which is placed over the control panel in any position.

It is verified in the course of this test that inadvertent operation of a hotplate burner does not occur.

7.5 Verification of the operational requirements specific to parts of the appliance having burners with an automatic burner control system

7.5.1 General tests

7.5.1.1 Obtaining the rates

7.5.1.1.1 Obtaining the nominal heat input

7.5.1.1.1.1 General

EN 30-1-1:2008+A2:2010, 7.3.1.2.1.1 shall apply for the determination of the nominal heat input and the technical nominal heat input if appropriate.

NOTE EN 30-1-2:2012, 7.3.1.2.1 gives additional testing criteria appropriate to appliances having forced-convection ovens and/or grills.

7.5.1.1.1.2 Operating conditions

The measurements are taken with the burner operating under the following conditions.

a) Hotplate burners

A pan is placed on an uncovered burner in accordance with 7.1.5.1.

With the appliance at ambient temperature, the burner is ignited and operated for 10 min.

Measuring begins at the end of the tenth minute and finishes when the highest number of complete revolutions of the meter have been made at, or before, the end of the thirteenth minute.

If the burner is controlled by a thermostat, precautions are taken, if necessary, to ensure that this does not operate during the measurement e.g. by increasing the water content of the pan.

If the burner has a control (e.g. energy regulator) that causes the burner to cycle on-off, or high-low, under all conditions of operation, it shall be ensured that the duration of the “on” and “off”, or “high” and “low”, periods of the cycle are constant when the measurements are taken.

In the case of an on-off control, the “off” part of the cycle is overridden after 10 min of operation and the heat input determined as described above with burner operating continuously in the “on” state. It is essential that the means used to override the “off” part of the cycle does not affect the gas rate in the “on” part of the cycle. The nominal heat input is determined from the mean gas flow rate or mass rate, V_m or M_m, over one complete cycle of the control. Therefore, V_m replaces V, or M_m replaces M, in the formulas referred to in 7.5.1.1.1.1.

V_m is calculated from the following formula:

$$V_m = \frac{V_{measured} \cdot t_{on}}{t_{on} + t_{off}}$$

M_m is calculated from the following formula:

$$M_m = \frac{M_{measured} \cdot t_{on}}{t_{on} + t_{off}}$$

where

V_m is the mean volumetric gas flow rate in cubic metres per hour;

$V_{measured}$ is the measured gas flow rate in cubic metres per hour;

M_m is the mean mass rate in kilograms per hour;

$M_{measured}$ is the measured mass rate in kilograms per hour;

t_{on} is the duration of the “on” period in seconds;

t_{off} is the duration of the “off” period in seconds.

In the case of a high-low control, the “low” part of the cycle is overridden after 10 min of operation and the heat input determined as described above with the burner operating continuously in the “high” state. This procedure is repeated with the “high” part of the cycle overridden and the heat input determined with the burner operating continuously in the “low” state. It is essential that the means used to override the “high” and the “low” parts of the cycle do not affect the gas rate when the burner is operating in the other state. The nominal heat input is determined from the mean gas flow rate or mass rate, V_m or M_m, over one complete cycle of the control. Therefore, V_m replaces V, or M_m replaces M, in the formulas referred to in 7.5.1.1.1.1.

V_m is calculated from the following formula:

$$V_m = \frac{V_H \cdot t_H + V_L \cdot t_L}{t_H + t_L}$$

M_m is calculated from the following formula:

$$M_m = \frac{M_H \cdot t_H + M_L \cdot t_L}{t_H + t_L}$$

where

V_m is the mean volumetric gas flow rate in cubic metres per hour;

V_H is the volumetric gas flow rate in the “high” state measured in cubic metres per hour;

V_L is the volumetric gas flow rate in the “low” state measured in cubic metres per hour;

M_m is the mean mass rate in kilograms per hour;

M_H is the mass rate in the “high” state measured in kilograms per hour;

M_L is the mass rate in the “low” state measured in kilograms per hour;

t_H is the duration of the “high” period in seconds;

t_L is the duration of the “low” period in seconds.

If appropriate, the technical nominal heat input is checked using the volume or mass rates obtained when the burner is operating continuously in the “on” or “high” state as described above. This volume, or mass rate, replaces *V* or *M*, in the formulas referred to in 7.5.1.1.1.1.

b) Ovens with or without thermostat

Measuring begins from ignition, with the thermostat or control device at the maximum setting and ends when the highest number of complete revolutions of the meter have been made at, or before, the end of the fifth minute. The measurement is carried out with the door open if this is possible. If operation of the oven is not possible with the door open, the measurement is made with the door closed.

If the burner has a control (e.g. energy regulator) that causes the burner to cycle on-off, or high-low, under all conditions of operation, the procedure described in a) for hotplate burners is used to determine the mean gas flow rate, V_m or the mean mass rate, M_m.

However, in this case the overriding of parts of the cycle is carried out at the start and the measurement is carried out in common with other oven burners during the first 5 min of operation.

c) Grills

The burner is ignited and operates for 10 min, with the control device at its highest setting and the door open.

Measuring begins at the end of the tenth minute, and ends when the highest number of complete revolutions of the meter have been made at, or before, the end of the thirteenth minute.

If the burner has a control (e.g. energy regulator) that causes the burner to cycle on-off, or high-low, under all conditions of operation, the procedure described in a) for hotplate burners is used to determine the mean gas flow rate, V_m or the mean mass rate, M_m.

d) For burners without gas rate adjusters

The heat input is measured for each reference gas with the appliance supplied at a corresponding normal test pressure. The values obtained shall comply with the requirements of 6.4.1.1.

e) For burners with gas rate adjusters

Test no. 1

With the adjuster in the maximum flow position, the supply pressure is adjusted to the minimum value.

The values obtained shall comply with the requirements of 6.4.1.1.

Test no. 2

With the adjuster in the minimum flow position, the test pressure is adjusted to the maximum value.

The values obtained shall comply with the requirements of 6.4.1.1.

If the adjustment of the gas rate is made by varying the pressure upstream of the injector, these verifications are carried out with gases G 20, G 25, G 110.

However, if the adjustment is made by varying the cross-section of the injector, Test no. 1 is only carried out with the reference gas with the lowest Wobbe number. It is verified with the reference gas with the highest Wobbe number, under the corresponding normal test pressure, that the injector size corresponds to the nominal heat input in accordance with the requirements of 6.4.1.1.

The values obtained shall comply with the requirements of 6.4.1.1.

Test no. 3

The burner is adjusted according to the manufacturer's instructions under normal pressure. Using the reference gas or gases under normal test pressure, it is verified that the heat input complies with the requirements of 6.4.1.1 which apply to burners which are not fitted with a gas rate adjuster.

7.5.1.1.2 Obtaining the reduced heat input

7.5.1.1.2.1 General

EN 30-1-1:2008+A2:2010, 7.3.1.2.2.1 applies.

NOTE EN 30-1-2:2012, 7.3.1.2.2 gives additional testing criteria appropriate to appliances having forced-convection ovens and/or grills.

7.5.1.1.2.2 Operating conditions

After operation under the conditions described below, the burner control(s) is adjusted manually in accordance with the manufacturer's instructions to the position, or setting, corresponding to the reduced rate position, if any, or to the position, or setting, corresponding to the minimum thermal function of the burner.

The measurements are made after adjustment of the burner control. These measurements shall be based on one or more complete revolutions of the meter.

If the burner has a control (e.g. energy regulator) that causes the burner to cycle on-off, or high-low, under all conditions of operation, it shall be ensured that the duration of the "on" and "off", or "high" and "low", periods of the cycle are constant when the measurements are taken.

In the case of an on-off control, the "off" part of the cycle is overridden once steady conditions have been attained and the heat input determined as described above with the burner operating continuously in the "on" state. The reduced heat input is determined from the mean gas flow *rate* or mass rate, V_m or M_m, over one complete cycle of the control. Therefore, V_m replaces V, or M_m replaces M, in the formulas referred to in 7.5.1.1.1.1. V_m or M_m is calculated from the appropriate formula given in 7.5.1.1.1.2 a).

In the case of a high-low control, the "low" part of the cycle is overridden once steady state conditions have been attained and the heat input determined as described above with the burner operating continuously in the "high" state. This procedure is repeated with the "high" part of the cycle overridden and the heat input determined with the burner operating continuously in the "low" state. The reduced heat input is determined from the mean gas flow rate or mass rate, V_m or M_m, over one complete cycle of the control. Therefore, V_m replaces V, or M_m replaces M, in the formulas referred to in 7.5.1.1.1.1. V_m or M_m is calculated from the appropriate formula given in 7.5.1.1.1.2 a).

a) Hotplate burners and grills

The measurement is taken after 10 min of initial operation at nominal heat input, or, if appropriate, the technical nominal heat input. Alternatively, the measurement may be made immediately after the measurement for obtaining nominal heat input.

b) Oven

The door is closed. The measurement is taken after 30 min of initial operation in accordance with 7.1.6.

7.5.2 Specific tests for hotplates

7.5.2.1 Ignition, cross-ignition, flame stability

7.5.2.1.1 General

The appliance is installed according to 7.1.4.2 in a suitably ventilated room.

Each burner is adjusted under the conditions described in 7.1.4.1 with each reference gas belonging to the appliance category.

The burner is lit in accordance with the manufacturer's instructions.

Where the use of a pan is required on a burner in the following tests, a pan in accordance with 7.1.5 is used, preferably one made of glass so that the flame can be observed.

In the case of temporary griddles and temporary covered burners, the burner is tested firstly with the plate or griddle in place, then as an uncovered burner.

When covered burners are tested individually, the tests are carried out without a pan. The tests in which they operate simultaneously with other burners of the hotplate are carried out with the pans recommended in 7.1.5.1. However, if all of the hotplate burners are enclosed covered hotplate burners, the simultaneous tests are carried out without pans.

In the case of uncovered burners, the use of pans is as specified in each test.

In all cases, hotplate burners are tested successively in the following order: back right burner, back left burner, front left burner, front right burner, where the hotplate has four burners. If the hotplate has a different number of burners, the order of ignition is based on the order given for four burners.

In tests requiring the operation of ovens and grills placed beneath the hotplate, all these ovens and grills operate simultaneously if this is possible.

If simultaneous operation is not possible because there is an oven and grill in the same compartment, the tests are carried out once with the oven in operation and once with the grill in operation. If there is a second oven or grill beneath the hotplate, it operates in both cases.

The requirements for ignition, cross-ignition and flame stability in 6.5.1 are verified during the following tests. However, for independent hotplates, the tests in 7.5.2.1.2 second group, requiring the use of reference gases and those in 7.5.2.1.3 first group, do not apply.

7.5.2.1.2 Cold tests

With the appliance at ambient temperature, the correct ignition and flame stability of each of the hotplate burners is checked with them operating individually.

Two groups of tests are carried out under the following conditions:

First test group

The appliance is cold at the start of the test.

Uncovered burners are tested with and without a pan.

Correct ignition and cross-lighting of each burner are checked individually with the appliance supplied successively with each of the reference gases at the normal test pressure.

After 5 s operation, the burner control is manually adjusted to its reduced rate position or setting. If the control requires rotation, or a sliding action, for its operation, this adjustment is carried out at normal speed[7)]. It is verified that light back has not occurred and that the requirements of 6.5.1, concerning extinction of the burner in these circumstances, are met.

The burner control is then manually adjusted to its maximum position or setting and flame stability is verified.

After examining the flames, the burner is turned off.

Second test group

1) The appliance is cold at the start of the test.

Any ovens and/or grills situated under the hotplate, whether gas or electric, are put into operation for 3 min and continue to operate throughout the test.

Uncovered burners are tested with and without a pan.

With the appliance supplied successively with each of the reference gases under normal test pressure, correct ignition and cross-lighting of each of the burners, tested individually, are verified between the end of the third minute and the end of the fifth minute after ignition of the oven and/or the grill.

Once each burner has been tested, the burner is turned off. At the end of the test, the appliance is cooled.

2) With the appliance cold at the start of the test, any ovens and/or grills are operated for 3 min and continue to operate throughout the test.

Uncovered burners are tested without a pan.

With the appliance supplied with the limit flame lift gas(es) of the category to which the appliance belongs under maximum test pressure, the ignition, cross-lighting and flame stability of each of the burners, tested individually, are verified between the end of the third minute and the end of the eighth minute after ignition of the ovens and/or grill.

Following examination of the flames of each burner, the burner control is turned off. At the end of the test, the appliance is cooled.

7.5.2.1.3 Hot tests

Correct ignition of the burner and flame stability are verified for each hotplate burner tested individually.

Any ovens and/or grill situated under the hotplate, whether gas or electric, are operated in accordance with 7.1.6.

Ovens operate initially for 30 min, the grill, if it can operate alone, for 15 min. Where a separate oven and grill can operate simultaneously, the grill is put in operation 15 min after the oven.

Three groups of tests are carried out under the conditions described below.

If it is necessary during the execution of one group of tests to cool the appliance, for example in order to change gas, the initial conditions fixed for the corresponding group of tests shall be re-established before any further test is carried out.

First test group

The ovens and/or grills are kept in operation.

7) Operation at fairly constant speed, in a time of approximately 1 s.

The tests are carried out without a test pan on the burner.

1) With the appliance supplied successively with each of the reference gases under normal pressure, correct ignition and cross-lighting of each burner, tested individually in the order stated in 7.5.2.1.1, are verified.

2) With the appliance supplied with the flame lift gas(es) of the category to which the appliance belongs under maximum pressure, ignition, cross-lighting and flame stability are verified for each burner when tested individually.

Following examination of the flame of each burner, the burner control is turned off.

Second test group
For the purposes of the test, the second test group is carried out immediately after the first group, with the ovens still in operation.

However, if the first test group includes the operation of a grill, the appliance is allowed to cool down, then is put into operation again under the conditions stated for the first test group.

A pan is placed centrally on each of the burners and the electric cooking plates, according to 7.1.5.1. However, if all of the hotplate burners are enclosed covered burners, the test pans are not used.

All the hotplate burners or electric cooking plates are operated initially at reduced rate for 10 min, then each burner is successively:

— extinguished;

— ignited in accordance with the instructions for use.

The pan is not removed during ignition.

For these tests, the following procedure shall be used:

1) with the appliance supplied successively with each of the reference gases under normal test pressure, the correct ignition and cross-lighting of each burner, tested individually, are verified;

2) with the appliance supplied with the flame lift limit gas(es) of the category to which the appliance belongs under maximum test pressure, ignition, cross-lighting and flame stability are verified for each burner when tested individually.

Following examination of the flame, the burner control is manually adjusted from its full-on position or setting to its reduced rate position or setting. If the control requires rotation, or a sliding action, for its operation, this adjustment is carried out at normal speed[8)]. In the course of this operation it is verified that light back has not occurred and that the requirements of 6.5.1, concerning extinction of the burner in these circumstances, are met.

3) With the hotplate burner controls adjusted to their reduced rate positions or settings, it is then verified that, with the reference gas under normal test pressure, the requirements of 6.5.1, concerning light back and extinction of the burner as a result door movements, are met:

— during opening or closing the oven door at normal speed[9)];

— during opening or closing at normal speed[10)] of the door of the housing unit or each of the doors of the housing unit in succession, if there are several.

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8) Operation at fairly constant speed, in a time of approximately 1 s.

9) Complete opening or closing, at fairly constant speed, in a time of approximately 1 s.

10) Operation at fairly constant speed, in a time of approximately 1 s.