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BSI Standards Publication

# Multi-firing sauna stoves fired by natural wood logs — Requirements and test methods

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**National foreword**

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The UK participation in its preparation was entrusted to Technical Committee RHE/28, Domestic solid mineral fuel appliances.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.



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EUROPEAN STANDARD

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# EN 15821

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English Version

# Multi-firing sauna stoves fired by natural wood logs - Requirements and test methods

Poêles de sauna à allumage multiple à bûches de bois naturelles - Exigences et méthodes d'essai

Mehrfach befeuerbare Saunaöfen zur Verfeuerung fester Brennstoffe - Anforderungen und Prüfverfahren

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# Foreword

This document (EN 15821:2010) has been prepared by Technical Committee CEN/TC 295 “Residential solid fuel burning appliances”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2011, and conflicting national standards shall be withdrawn at the latest by June 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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For relationship with EC Directive(s), see informative Annex ZA, which is an integral part of this document.

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## 1 Scope

This European Standard covers multi-firing sauna stoves in which the heating stones are separated from and indirectly heated by the fire and the flue gases and which may be re-fuelled with several fuel loads.

This European Standard specifies requirements relating to the design, manufacture, construction, safety and performance (efficiency and emission) of multi-firing sauna stoves fired by wood logs and provides instructions for them. Furthermore, it also gives provisions for evaluation of conformity (i.e. initial type testing (ITT) and factory production control (FPC) and marking of these products.

This standard is applicable to hand-fuelled intermittent burning multi-firing sauna stoves, which provide heat into the space where they are installed.

These multi-firing sauna stoves may be supplied either as an assembled appliance or as a manufacturer's pre-designed unit consisting of pre-fabricated components designed to be built on site in accordance with the manufacturer's specified assembly instructions. One-off installations are not included.

These multi-firing sauna stoves may burn only natural wood logs in accordance with the appliance operating instructions.

Single-firing heat storage sauna stoves, in which the stones are directly heated by the fire and the flue gases, which pass through them, are not covered by this European Standard. This standard is also not applicable to mechanically fed sauna stoves, sauna stoves having fan assisted combustion air, sauna stoves fitted with a boiler, sauna stoves with incorporated flue or sauna stoves having any electrical connection.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 14774-1, *Solid biofuels — Determination of moisture content — Oven dry method — Part 1: Total moisture — Reference method*

EN 14775, *Solid biofuels — Determination of ash content*

EN 14918, *Solid biofuels — Determination of calorific value*

EN 15104, *Solid biofuels — Determination of total content of carbon, hydrogen and nitrogen — Instrumental methods*

EN 15148, *Solid biofuels — Determination of the content of volatile matter*

EN 15289, *Solid Biofuels — Determination of total content of sulphur and chlorine*

EN 60335-2-53, *Household and similar electrical appliances — Safety — Part 2-53: Particular requirements for sauna heating appliances (IEC 60335-2-53:2002)*

EN ISO 9001:2008, *Quality management systems — Requirements (ISO 9001:2008)*

ISO 2859 (all parts), *Sampling procedures for inspection by attributes*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.




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**3.1**
**air grilles**
components in the inlet and outlet openings to distribute and direct convection air flow

**3.2**
**air inlet control**
manual or automatic device which controls the quantity of air supplied for combustion

**3.3**
**appliance family**
group of appliances of similar construction and/or performance characteristics where it is permissible to test only selected appliances in accordance with the requirements of this standard

**3.4**
**ash content of the fuel**
solid matter remaining after the complete combustion of solid fuel

**3.5**
**ashpan**
removable receptacle shaped to receive the residue falling from the firebed

**3.6**
**ashpit**
enclosed chamber designed to receive the residue or the ashpan

**3.7**
**ashpit loss**
part of the residue which is combustible

**3.8**
**basic firebed**
quantity of glowing embers which ensures ignition of the test fuel to be charged

NOTE The basic firebed may be specified in the operating instructions.

**3.9**
**batch charge**
proportion of the test load as declared in the operating manual that can be added at specified intervals during the test period of the burning rate performance test

**3.10**
**bottomgrate**
part of the appliance at the base of the firebox which supports the firebed through which the residue falls into the ashpan or ashpit and through which combustion air and/or combustion gases may be drawn

**3.11**
**bottomgrate bars**
**firebars**
bars supporting the fuelbed, separate or integral with a surrounding frame

**3.12**
**charging door**
door which covers the refuelling opening

**3.13**
**combustion air**
air supplied to the firebox which is entirely or partially used to burn the fuel

**3.14**
**combustion gases**
compounds in gaseous form produced inside an appliance when fuel is burned




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**3.15**
**de-ashing**
process of clearing a fuelbed and discharging the residue into the collecting receptacle

**3.16**
**de-ashing mechanism**
device to agitate or disturb the ash to facilitate its removal from the firebed

NOTE It may also be used to change the bottomgrate operating position on some multi-firing sauna stoves.

**3.17**
**draught regulator**
inlet device for admission of air downstream of the firebed, enabling the flue draught to be controlled

**3.18**
**efficiency**
ratio of total heat output to the total heat input during the burning period expressed as a percentage

**3.19**
**firebox**
**combustion chamber**
part of the multi-firing sauna stove in which the fuel is burned

**3.20**
**firebox opening**
aperture in the firebox through which a multi-firing sauna stove may be fuelled

**3.21**
**firedoor**
door through which the fire may be viewed and which may be opened to allow refuelling of the firebed

**3.22**
**flue by-pass device**
device which in the open position allows flue gases to pass directly to the flue spigot/socket

NOTE This can be used as a preheating aid to overcome chimney condensation.

**3.23**
**flue damper**
mechanism to change the flow of the combustion gases

**3.24**
**flue draught**
differential between the static pressure in the place of installation and the static pressure at the flue gas measurement point

**3.25**
**flue gases**
gaseous compounds leaving the multi-firing sauna stove flue spigot or socket and entering the flue gas connector

**3.26**
**flue gas connector**
duct through which flue gases are conveyed from the flue spigot of the multi-firing sauna stove into the chimney flue

**3.27**
**flue gas mass flow**
mass of flue gas drawn off from the multi-firing sauna stove per unit of time




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**3.28**
**flue gas temperature**
temperature of the flue gas at the specified point in the measurement section

**3.29**
**flue spigot**
**flue socket**
integral part of the multi-firing sauna stove for connecting the flue gas connector thus permitting the deliberate escape of products of combustion into the chimney flue

**3.30**
**flueway**
part of a multi-firing sauna stove designed to convey combustion gases from the firebox to the flue spigot/socket

**3.31**
**front firebars**
grating or plate fitted at the front of the firebox opening to prevent spillage of fuel and ash or to change the firebox capacity, or both

**3.32**
**total heat input**
quantity of energy which the fuel provides to the multi-firing sauna stove

**3.33**
**integral fuel storage container**
enclosed area forming part of the multi-firing sauna stove, but not connected directly to the fuel charging area, in which fuel is stored prior to it being physically transferred by the user to the fuel charging position

**3.34**
**operating tool**
device supplied with the multi-firing sauna stove for handling movable and/or hot components

**3.35**
**primary air**
combustion air which passes through the fuel bed

**3.36**
**recommended fuel**
fuel of commercial quality, listed in the multi-firing sauna stove operating instructions, and shown to achieve the claimed performance when tested in accordance with this European Standard

**3.37**
**residue**
ashes, including combustibles, which collect in the ashpit

**3.38**
**sauna stove**
stove that has a fully enclosed firebox with a firedoor which is normally closed, that distributes heat by radiation and/or convection and is also fitted with stones or other heat retaining material onto which water is poured to produce hot steam/vapour that rises from the hot sauna stones, and that may also provide hot water for washing when fitted with an optional open water vessel

**3.39**
**multi-firing sauna stove**
sauna stove in which the stones are separated from and indirectly heated by the fire and the flue gases and which may be refuelled with several successive fuel loads also during sauna bathing

**3.40**
**solid fuel**
naturally occurring or manufactured solid mineral fuels, natural or manufactured wood logs and peat briquettes




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**3.41**
**space heating output**
heat output provided as convection and radiation to the room

**3.42**
**test fuel**
fuel of commercial quality being representative of its type to be used for testing multi-firing sauna stoves

**3.43**
**test load**
mass of test fuel declared in the operating instructions for the burning rate performance test

NOTE The test load can be added as batch charges if this is indicated in the multi-firing sauna stove instructions.

**3.44**
**total heat output**
total heat output of the multi-firing sauna stove quoted in the operating instructions and achieved under defined test conditions when burning the specified test fuel and calculated as the total heat input less the flue and unburned carbon losses

**3.45**
**water vessel**
open container in which water for washing purposes is heated and which is fitted as an option on a sauna stove

**3.46**
**working surfaces**
surfaces of an multi-firing sauna stove designed to transmit heat to the surrounding atmosphere

# 4 Requirements for materials, design and construction

## 4.1 Production documentation

The type of multi-firing sauna stove submitted for testing shall be stated.

The parameters and characteristics considered in making the decisions in relation to either the family or range of multi-firing sauna stoves to be submitted for initial type testing (see 8.2.1) shall be recorded. Where changes are made to a multi-firing sauna stove in the design, the raw material, the supplier of the components, or in the production process, which would significantly alter the performance characteristics of the appliance, especially in respect of one or more of the list of characteristics detailed in Table 1 and Table 2 (see 8.2.2), these shall be recorded. A copy of the parameters and characteristics considered in making the decisions shall be included in the production documentation for each multi-firing sauna stove.

To identify a multi-firing sauna stove, related documents and/or scaled assembly drawings shall be available showing the basic design and construction of the multi-firing sauna stove. The documentation and/or the drawings shall include at least the following information:

— the specification of the materials used in the construction of the multi-firing sauna stove;

— the fuel loading mass and, if applicable, the number and mass of any batch charges.

For multi-firing sauna stoves, which are supplied as pre-designed units consisting of prefabricated components, designed to be assembled on site, then detailed assembly instructions for the construction of the appliance shall be provided. In addition, details of making a gas tight connection between the chimney, the appliance and the flue gas connector shall also be provided. For testing purposes the multi-firing sauna stove shall be constructed and tested in accordance with these instructions.




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## 4.2 Construction

### 4.2.1 General construction

#### 4.2.1.1 Design, manufacture and assembly

The shape and dimensions of the components and equipment of multi-firing sauna stoves and the method of design and manufacture and, if assembled on site, the method of assembly and installation shall ensure that, when operated as specified in accordance with the test procedures of this standard and exposed to the associated mechanical, chemical and thermal stresses, the multi-firing sauna stove shall operate reliably and safely so that, during normal operation, no combustion gas posing a hazard can escape into the room in which the multi-firing sauna stove is installed, nor can embers fall out. Non-combustible materials shall be used except for the following applications:

— components or accessories fitted outside the multi-firing sauna stove;

— internal components of controls and safety equipment;

— operating handles.

No part of the multi-firing sauna stove shall comprise any material known to be harmful.

Component parts of the multi-firing sauna stove, which require periodic replacement and/or removal, shall be either so designed or marked for identification to ensure correct fitting.

NOTE Because the entire heat dissipating surfaces of the appliance including the flue spigot/socket and the flue gas connector are working surfaces, there is no requirement for limiting the surface temperature of the appliance.

#### 4.2.1.2 Durability

The durability aspects of the multi firing sauna stove shall be deemed to be satisfied if it is shown to meet the constructional requirements specified in 4.2.2 to 4.2.10, the safety requirements specified in Clause 5 and the performance requirements specified in Clause 6 of this standard.

NOTE The long practice with these products shows that such an approach for dealing with durability is sufficient.

### 4.2.2 Cleaning of heating surfaces

All heating surfaces shall be accessible from the flue gas side for inspection and cleaning with brushes, scrapers or chemical agents by means of sufficient cleaning openings.

### 4.2.3 Flue spigot or socket

The flue spigot or socket shall be designed to enable a gas tight connection to be made between the flue gas connector and the multi-firing sauna stove.

Where the flue gas connector fits over an outlet spigot, the overlap shall be a minimum of 25 mm. Where the flues gas connector fits into a socket, the insertion depth shall be a minimum of 25 mm.

NOTE It is recommended that provision is made for sealing internal connections with heat resistant sealing compound and/or sealing rope, if required.

### 4.2.4 Ashpan and ash removal

A means for the removal of the ash residue from the multi-firing sauna stove shall be provided. When an ashpan is provided, it shall be capable of containing the combustion residue from two full charges of fuel whilst retaining sufficient space above to allow adequate primary air flow through the bottom grate or firebed. If the ashpan resides in the multi-firing sauna stove, it shall locate in the ashpit in such a way that it allows the free passage of primary air and in such a position that it does not obstruct any primary air inlet control.




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The ashpan shall be designed and constructed to ensure that:

a) it effectively collects the residue from beneath the bottomgrate;

b) it can be easily and safely withdrawn, carried and emptied when hot, using the tool(s) provided, without undue spillage of residue material.

NOTE The ashpan can be shovel shaped.

#### 4.2.5 Bottomgrate

Where the bottomgrate is removable, it shall be so designed or marked as to ensure correct fitting.

If a de-ashing mechanism is fitted, it shall be capable of effectively de-ashing the fuelbed without undue effort.

If it is necessary to remove the ashpit door to de-ash the fire, the multi-firing sauna stove shall be designed to minimise ash or fuel spillage during the de-ashing operation.

NOTE The preferred design should allow de-ashing to be carried out with the firedoor(s) and ashpit door(s) closed.

#### 4.2.6 Combustion air supply

##### 4.2.6.1 Primary air inlet control

The multi-firing sauna stove shall be fitted with either a thermostatically controlled primary air inlet control or a manual primary air inlet control. The adjusting control shall be clearly visible and shall be permanently marked so that its operation is readily understandable.

The design shall be such that during operation of the multi-firing sauna stove, neither ash nor unburned fuel can prevent the movement or closure of the air inlet control.

The ‘cold’ setting of the air inlet control shall be clearly marked or the method of adjustment shall be described in the user instructions.

The thermostat shall have a variable temperature range and be of the immersion or dry pocket type.

##### 4.2.6.2 Secondary air inlet control

Where a secondary air inlet control is provided, the position of air entry shall be so designed that the passage of air is not restricted when the firebox is filled to the recommended capacity.

#### 4.2.7 Control of flue gas

If a flue damper is fitted, it shall be of a type, which does not block the flue totally. The damper shall be easy to operate and incorporate an aperture within the blade, which in a continuous area occupies at least 20 $cm^2$ or 3 % of the cross-sectional area of the blade if this is greater.

The position of the damper shall be recognizable from the setting of the device.

If a draught regulator is fitted, the minimum cross sectional area requirement shall not be applicable, but the device shall be easily accessible for cleaning.

#### 4.2.8 Firedoors and charging doors

When the multi-firing sauna stove is equipped with a charging door, that door shall be large enough to allow the appliance to be filled with the recommended commercial fuels in accordance with the user operating instructions. Fire doors and charging doors shall be designed to prevent accidental opening and to facilitate positive closure.




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#### 4.2.9 Flue bypass device

Any flue bypass device shall be easily operable. The extreme positions corresponding to full opening and closing shall be easily and readily identifiable.

#### 4.2.10 Front firebars and/or deepening plate

Front firebars shall be designed to retain the fuel or ash such that there is no undue spillage of ash or burning fuel from the sauna stoves during normal operations, particularly during refuelling or de-ashing.

If the appliance is fitted with removable front firebars and/or deepening plate, they shall be of a design such that they can neither be incorrectly fitted nor accidentally dislodged.

## 5 Safety requirements

### 5.1 Temperature rise of the operating components

If the manipulation of the operating components does not require the assistance of tools, the surface temperatures, measured only in the areas to be touched, shall not exceed the ambient temperature outside of the test room by more than the following when tested in accordance with A.4.6:

— 55 K for metal;

— 65 K for porcelain, vitreous enamel or similar materials;

— 80 K for plastics, rubber or wood.

If these temperatures are exceeded, the need to use an operating tool shall be indicated in the instructions. This tool shall be supplied with the appliance.

NOTE A suitable glove is regarded as a tool.

### 5.2 Temperature of adjacent combustible materials

When tested during the performance test at nominal heat output in accordance with A.4.6, and the temperature safety test in accordance with A.4.7, and when the appliance is installed in accordance with the clearance distances specified in the installation instructions, the temperature of the sauna test room walls and/or ceiling or any other structure surrounding the appliance comprising combustible material as measured by the wooden rod shall not exceed either the ambient temperature by more than 115 K during the nominal heat output test nor exceed it by 140 K during the safety test.

If, according to the installation instructions, the sauna stove can be installed on a combustible base, then the floor temperature shall be measured and the temperature shall not exceed the ambient air temperature outside the sauna test room by more than 65 K. If necessary the floor shall be protected in accordance with the installation instructions, and the temperatures shall be measured below the floor protection device.

The ambient air temperature outside the sauna test room shall be (25 ± 5) $^{o}$C.

## 6 Performance requirements

### 6.1 Flue gas temperature

When tested in accordance with A.4.6, the flue gas temperature shall be measured and the mean value calculated over the nominal heat output test period and recorded in the installation instructions.




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### 6.2 Carbon monoxide emission

When tested at the declared nominal heat output in accordance with A.4.6, the mean carbon monoxide concentration calculated to 13 % oxygen ($O_2$) content in the flue gas shall be less than or equal to the declared value and shall not exceed 1,0 %.

### 6.3 Efficiency

When tested at the declared nominal heat output in accordance with A.4.6, the measured total efficiency derived from the mean of at least two test results shall be greater than or equal to the declared value and shall equal or exceed 50 %.

### 6.4 Flue draught

When undertaking the burning rate performance test in accordance with A.4.6, the flue static pressure shall be kept within (12 ± 2) Pa. Where this flue draught value needs to be exceeded in order to obtain the declared burning rate, the required flue draught shall be clearly stated in the appliance's installation instructions. For the temperature safety test in accordance with A.4.7 the appliance shall be tested at a flue draught value greater by 3 Pa than that used during the burning rate performance test and the static pressure shall be kept within ±2 Pa of this specified value.

### 6.5 Refuelling loads

The mass of the total amount of fuel and the refuelling interval(s) and/or the number and mass of batch charges, which shall be used during the burning performance test in accordance with A.4.6, shall be as stated in the operating instructions. Any batch charge shall not be less than 20 % of the total fuel load.

The minimum fuel burning period shall not be less than 30 minutes. The total amount of fuel fired shall be enough to heat up the temperature of the sauna test room to at least 90 $^{o}$C.

The slope formed by the test load shall not obstruct, even partially, any flue.

### 6.6 Space heating output

The space heating output declared in the operating instructions and on the marking label shall not exceed the space heating output measured in accordance with A.4.6.

## 7 Instructions

### 7.1 General

Instructions, written in the language of the Member State of intended destination, shall accompany the appliance and shall describe the installation, operation, maintenance and, if assembled on site, the method of assembly of the appliance. The instructions shall not be in contradiction to the requirements or test results in accordance with this standard.

### 7.2 Installation instructions

The installation instructions shall contain at least the following information:

— A statement to the fact that “all local regulations, including those referring to national and European standards need to be complied with when installing the appliance”;

— The type (model or number) of the appliance;

— The nominal heat output(s) in kW or W;

— The space heating output in kW or W;

— The safety clearance distances against combustible materials, and/or the other protective measures, e.g. protection shields that shall be taken to protect the building construction;

— The requirements for the supply of combustion air, for the simultaneous operation with other appliances and for the operation of exhaust air devices;

NOTE Extractor fans when operating in the same room or space as the appliance may cause problems.

— The need of any air inlet grilles that shall be so positioned that they are not liable to blockage;

— The minimum size of the opening for combustion and ventilation air into the room in which the appliance is installed;

— The mass of the appliance in kg;

— The minimum flue draught for nominal heat output, (where applicable, with open and closed firedoors);

— The flue gas mass flow in g/s, where applicable, with open and closed firedoor operations as specified in the operating instructions (or alternatively the nominal heat output and the appliance efficiency and mean $CO_2$ concentration when operating at nominal heat output shall be given for all fuel types);

— Whether the appliance is suitable for installation in a shared flue system;

— The flue gas temperature directly downstream of the flue spigot/socket in °C (with closed firedoors) under nominal heat output conditions;

— The need to install the appliance on a non combustible base;

— The floors: the appliance shall be installed on floors with an adequate load-bearing capacity; if an existing construction doesn't meet this prerequisite, suitable measures (e.g. load distributing plate) shall be taken to achieve it;

— The assembly of the appliance on-site, if applicable;

— Advice on the need to provide access for cleaning the appliance, the flue gas connector and the chimney flue;

— The installation of the damper device, if applicable;

— A statement of the size of room in which the appliance can be installed;

— Minimum and maximum volume of sauna room in which the appliance can be installed;

— Minimum dimensions of chimney.

## 7.3 User operating instructions

Each appliance shall be accompanied by instructions in the language of the country in which it is to be operated, containing all important details regarding the operation for the concerned appliance.

The operating instructions shall contain at least the following information:

— A statement to the fact that “all local regulations, including those referring to national and European standards need to be complied with when installing the appliance”;

— A list of the recommended fuels including type and size in accordance with this standard;

— Details of the method of refuelling and de-ashing the appliance and the maximum filling height in the firebox and typical refuelling loads at nominal heat output for various recommended fuels;

— A description of the correct instructions for safe and efficient operation of the appliance including the ignition procedure;

— Advice against the use of unsuitable and non recommended fuels, including advice against the use of liquid fuels;

— The operation of all adjusting devices, dampers and controls;

— Ventilation requirements for simultaneous operation with other heating appliances (where applicable);

— The correct operations for seasonal use and under adverse flue draught or adverse weather conditions;

— Advice on the need for regular maintenance by a competent engineer;

— A warning that the firebox and ashpit cover shall be kept closed except during ignition, refuelling and removal of residue material to prevent fume spillage, unless the appliance is intended to be operated with open firebox;

— The need for regular cleaning of the appliance, of the flue gas connector and the chimney flue and highlighting the need to check for blockage prior to re-lighting after a prolonged shut down period;

— Advice on the adequate provision of combustion and ventilation air and on keeping air intake grilles; supplying combustion air, free from blockage;

— Instructions on simple fault finding and the procedure for the safe shut down of the appliance in event of malfunction e.g. overheating;

— Warning that parts of the appliance, especially the external surfaces, will be hot to touch when in operation and due care will need to be taken;

— The means of protection against risk of fire in and outside the heat radiation area;

— Warning against any unauthorised modification of the appliance;

— Use of only replacement parts recommended in the installation instructions;

— Advice about the actions to be taken in the event of a chimney fire;

— Whether the appliance is suitable for installation in a shared flue system;

— Advice on the adjustment of any air grilles, where fitted.

# 8 Evaluation of conformity

## 8.1 General

The compliance of a multi-firing sauna stove with the requirements of this standard and with the stated values shall be demonstrated by:

— Initial type testing,

— Factory production control, including product assessment.




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For the purposes of testing, appliances may be grouped into families, where it is considered that the selected performance characteristic or characteristics, especially in respect of those detailed in Table 1 and Table 2, is/are common to all appliances within that family.

## 8.2 Initial type testing

### 8.2.1 General

Initial type testing (ITT) shall be performed to demonstrate conformity to this standard. In the case of an appliance already in production the appliance to be tested shall be chosen at random and be representative of general production and a written declaration to this effect shall be provided by the manufacturer.

In the case of a prototype, the appliance tested shall be a model representative of the intended future production and the manufacturer shall provide a written declaration that this is the case. When the appliance goes into production, a dimensional and constructional check shall be undertaken on the production appliance to confirm it is in agreement with the originally type tested prototype model. If the dimensions of the production appliance diverge by more than 1 % of the dimension or ±3 mm whichever is the lesser from that of the prototype in relation to the firebox and/or combustion chamber and any other dimension considered to be critical to the safety or performance of the appliance (especially in respect of the characteristics of Table 1 and Table 2), then the production appliance itself shall be subjected to further type testing as detailed in 8.2.2.

Similarly, if there is a change to the construction materials used which will adversely alter the performance characteristics of the appliance especially as regards its safety and/or the meeting of the performance characteristics of Table 2 then the production appliance itself shall be subject to further type testing as detailed in 8.2.2. This requirement regarding re-testing shall be applied if, during the subsequent production or at the start of a new production run, such a change is made to dimensions and/or construction materials. To ensure that this takes place, there shall be a dimensional/constructional check on a current production appliance over an ongoing period not exceeding 3 years to demonstrate conformity to type.

Where tests have been previously performed in accordance with the provisions of this standard (same product, same characteristic(s), test method, sampling procedure, system of attestation of conformity, etc.), then the results of these tests shall be taken into account for initial type testing purposes.

For a family or range of appliances, it shall be permissible to test only selected appliances across the family or range and to only verify selected constructional and performance characteristics on the others, subject to a clear decision being made that the appliances are part of a family or range of appliances. For the initial type test, at least a sufficient number of the appliances shall be chosen from across the family or range so as to represent adequately the family or range. The chosen appliances shall be subjected to complete testing to fully verify their compliance with all of the constructional and performance characteristics in accordance with this standard. For the other appliances in the family or range not chosen for complete testing, it shall be permissible to only verify selected constructional and/or performance characteristics to ensure their compliance with the requirements of this standard and/or to ensure they will perform the same as the fully type tested appliances of the family or range.

In selecting appliances for initial type testing from a product range based upon their nominal heat outputs as representing such a family, then appliances having the lowest and highest claimed nominal heat outputs shall be tested together with sufficient appliances chosen from within the range that the ratio of nominal heat output between the appliances does not exceed the ratio of 1,6:1.

Further, in deciding that the appliances belong to a family or range due account shall be taken of the construction and performance characteristics of each appliance especially in respect of the list of characteristics detailed in Table 1 and Table 2. The list of characteristics in Table 1 and Table 2 is not definitive and other aspects may need to be considered in making this judgement. Where a range of appliances of the same firebox and output have differing canopies or external cladding both in size and materials of construction (e.g. where the hot surface would be likely to be closer to combustible surfaces or there is a change from a lower to a higher conductivity or emissivity material), then at least one appliance shall be chosen, which represents the worst scenario case and demonstrates the safety of the range as regards surface temperature and safety of adjacent combustible materials.




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Where conformity is claimed to the standard for a family of appliances on a number of different fuel types, a selection of tests shall be made which demonstrates the conformity of the family in respect of the safety (Clause 5) and performance (Clause 6) on these fuels on the appliances especially to the list of characteristics detailed in Table 1 and Table 2.

The parameters, characteristics examined and considerations taken into account in making the decisions in relation to the family or range of appliances shall be recorded and a copy included in the production documentation for each appliance of the family or range (see 4.1).

### 8.2.2 Initial type testing for appliance changes

Whenever a change occurs in either the appliance design, the raw material, the supplier of the components, or the production process, which would significantly alter the performance characteristics of the appliance especially in respect of one or more of the list of characteristics detailed in Table 1 and Table 2, the initial type tests shall be repeated for the appropriate characteristic(s).

It shall be permissible for this further initial type testing to verify only selected constructional and/or performance characteristics to ensure their compliance with the requirements of this standard and/or with the fully type tested appliances of the family or range.

For a family or range of appliance, it shall be permissible to test only selected appliances across the family or range and to verify only selected constructional and performance characteristics on the others, subject to a clear decision being made that the appliances are part of a family or range of appliances.

In deciding the constructional and/or performance characteristics to be verified or the appliances to be tested (in the case of a family or range of appliances) due account shall be taken of the characteristics detailed in Table 1 and the performance criteria given in Table 2. The list of characteristics in Table 1 and Table 2 is not definitive and other aspects may need to be considered in making this judgement.

Where tests have been previously performed in accordance with the provisions of this standard, then these test results shall also be taken into account in making the decision.

The parameters and characteristics considered in making either the decisions in relation to the constructional and/or performance characteristics to be verified or the appliances to be tested (in the case of a family or range of appliances) shall be recorded and a copy included in the production documentation for each appliance (see 4.1).




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**Table 1 — Characteristics to take account of in deciding family of appliances**

| **A** | **Design, materials etc.** | **D** | ***Combustion air*** |
|---|---|---|---|
| ☐ | Exterior design, dimensions, weight etc. | ☐ | Cross sections of air ducts (primary/secondary) |
| ☐ | System for air convection/radiation | ☐ | Length of air ducts (primary/secondary) |
| ☐ | Ashpan | ☐ | Number of bends (primary/secondary) |
| ☐ | Materials | ☐ | Air inlets in combustion chamber (primary/secondary) |
| ☐ | Assembling methods, welding etc. | ☐ | Pre-heating of air |
| ☐ | Other issues _____ | ☐ | Air control system |
| ☐ | Sketches/Drawings | ☐ | Other issues _____ |
| **B** | **Combustion chamber** | **E** | ***Integral fuel storage container*** |
| ☐ | Dimensions of combustion chamber | ☐ | Size |
| ☐ | Flue baffle plate(s) arrangement | ☐ | Protection against transfer of heat |
| ☐ | Refractory material/insulation | ☐ | Insulation |
| ☐ | Front firebars/deepening plate | ☐ | Other issues _____ |
| ☐ | Temperature conditions | | |
| ☐ | Firedoor arrangement, glass component/area | | |
| ☐ | Bottom grate, de-ashing system | | |
| ☐ | Other issues _____ | | |
| | | | |
| **C** | **Flue ways** | | |
| ☐ | Cross sectional area | | |
| ☐ | Length of flue gas passages | | |
| ☐ | Flue spigot | | |
| ☐ | Pressure loss | | |
| ☐ | Transfer of heat | | |
| ☐ | Insulation | | |
| ☐ | Other issues _____ | | |

**Table 2 – Performance characteristics to take account of in deciding family of appliances**

| **Performance characteristic** | ***Requirement clauses in this EN*** |
|---|---|
| Emission of combustion products | 6.1, 6.4, 6.5 |
| Surface temperature | 5.1, 5.2 |
| Thermal output /Energy efficiency | 6.1, 6.2, 6.3, 6.4, 6.5, 6.6 |

## 8.3 Factory production control (FPC)

### 8.3.1 General

A permanent FPC system identifying areas of responsibility to ensure that the products placed on the market conform to the stated performance characteristics shall be established, documented and maintained. The FPC system shall consist of procedures, regular inspections and tests and/or assessments and the use of the results to control raw and other incoming materials or components, equipment, the production process and the product and shall comply with the requirements specified in 8.3.2 to 8.3.8.

A permanent FPC system conforming to the requirements of either EN ISO 9001:2008 or an otherwise equivalent system and made specific to the requirements of this standard is considered to satisfy the above requirements.

The manufacturer shall carry out FPC tests to monitor the conformity of the product. Sampling, testing or assessment shall be undertaken in accordance with ISO 2859 (all parts). The results of inspections, tests or assessments requiring action shall be recorded, as shall any action taken. The action to be taken when control values or criteria are not met shall be recorded.

### 8.3.2 Raw materials and components

The specifications of all incoming raw materials and components shall be appropriate for the intended use and shall be documented, as shall the inspection and testing scheme for ensuring the conformity of these materials and components.

### 8.3.3 Control of inspection, measuring and test equipment

All weighing, measuring and testing equipment used to demonstrate conformance of the product shall be calibrated and regularly inspected according to documented procedures, frequencies and criteria.

### 8.3.4 Process control

The manufacturer shall identify and plan the production processes, which directly affects the product characteristics, and shall ensure that these processes are carried out under controlled conditions. Where the required product characteristics cannot be fully verified by subsequent inspection and testing of the product, then the production processes shall be carried out by operators specifically trained to undertake this work.

### 8.3.5 Product inspection, testing and evaluation

#### 8.3.5.1 General

The manufacturer shall establish and maintain documented procedures for in-process and final inspection and testing, as appropriate to the product type, to ensure that the declared values of all of the product characteristics are maintained.

At least the following product characteristics, their criteria and means of control shall be included in the factory production control scheme:

a) materials of construction:

   1) type – composition/specifications,

   2) thickness,

   3) dimensions,

   4) finish;

b) insulation material:

1) specification of insulation material,

2) density value - thermal conductivity;

c) seals and sealant materials:

1) type, including identification or composition, when a conformity certificate is not available,

2) dimensions.

A supplier's declaration for material type and properties is accepted, provided that the supplier has an appropriate factory production control system to ensure the adequacy, consistency and accuracy of the material type and properties.

#### 8.3.5.2 Manufacturing checks

##### 8.3.5.2.1 Construction and dimensions

Construction and dimensions of critical parts shall be confirmed during the manufacturing and/or on completion as follows:

a) Flue spigot and/or socket;

b) Flueways;

c) Ashpan;

d) Bottomgrate;

e) Air supply – thermostat, manual control, inlet size, etc.;

f) Control of flue gas (damper);

g) Firedoors/charging doors;

h) Flue by pass;

i) Front firebars;

j) Boiler construction – dimensions, waterways, tappings, etc (if fitted);

k) Firebox/combustion chamber construction;

l) Convection system.

#### 8.3.5.2.2 Other checks

At least the following checks shall be carried out during the manufacturing process:

a) Sealing of components to avoid leakage;

b) Fitment of moving/interconnecting parts.

### 8.3.6 Non conforming products

The manufacturer shall establish and maintain documented procedures to ensure that, where the product does not conform to the specified requirements, then it is clearly identified and its placing on the market prevented. These procedures shall provide for documentation and segregation of the product and for notification to the various functions concerned. Any repaired and/or reworked products shall be re-inspected in accordance with the inspection, testing and evaluation plan.

### 8.3.7 Corrective and preventive action

The manufacturer shall establish and maintain documented procedures for implementing corrective and preventive action. The manufacturer shall implement and record any changes to the documented procedures resulting from corrective and preventive action.

### 8.3.8 Handling, storage, packaging, preservation and delivery

To the extent necessary to ensure conformity of the product to the specified requirements, the manufacturer shall establish and maintain documented procedures for handling, storage, packaging, preservation and delivery of the finished product following final inspection and test.

## 9 Marking

Each appliance shall be permanently and legibly marked, with the minimum following information, in a place where it is accessible so that the information can be read when the appliance is in its final location:

— The manufacturer's name or registered trade mark;

— The type or the model;

— The nominal output in kW or W;

— The space heating output in kW or W;

— The standard number, i.e. EN 15821:2010;

— The measured CO concentration at 13 % oxygen content and the determined appliance efficiency at nominal heat output, as defined in 6.2 and 6.3, respectively;

— The instruction "follow the user’s instructions";

— The minimum clearance distances from combustible materials, in mm;

— Flue gas temperature at nominal heat output;

— Minimum dimensions of chimney;

— Whether or not the appliance can be used in a shared flue;

— The words “use only natural wood logs as a fuel”.

If a label is used, it shall be durable and abrasion proof. Under normal operating conditions, the label shall not discolour, thus making the information difficult to read. Self-adhesive labels shall not become detached as a result of moisture or temperature.

NOTE Where ZA.3 covers the same information as this clause, the requirements of this clause are considered as met.




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# Annex A
(normative)

# Test methods

## A.1 Test environment

### A.1.1 Sauna test room temperature

The sauna test room temperature shall be measured at a point located 300 mm below the centre of the ceiling in the sauna test room as detailed in EN 60335-2-53.

### A.1.2 Ambient air temperature coming into the sauna test room

The temperature shall be measured at a distance of 1 m away from the centre of the air inlet of the sauna test room and in a position not influenced by any heat source.

For measurement of the ambient room temperature, a thermocouple or other temperature measuring device shall be placed, protected from radiation by an open ended cylindrical metal screen, with open ends and made of polished aluminium or material of equivalent reflectivity, nominal 40 mm in diameter and 150 mm long. The thermocouple or other temperature measuring device shall meet the uncertainty of measurement requirements specified in A.3.

### A.1.3 External sources

The test assembly shall be protected from direct influence of other heat sources, e.g. adjacent test assemblies and sunlight.

## A.2 Test assembly

### A.2.1 General

The test assembly shall consist of the test appliance installed in accordance with the appliance manufacturer's installation instructions into a sauna test room as specified in A.2.2.

The appliance shall be positioned in accordance with the manufacturer's installation instructions so that the sides facing the walls are at the manufacturer's minimum declared distance from combustible materials.

A measurement section constructed in accordance with A.2.3 shall be provided with means for determining the flue gas temperature in accordance with A.2.3.2, the flue gas composition in accordance with A.2.3.3 and the applied flue draught in accordance with A.2.3.4.

The appliance flue spigot/socket shall be connected by means of an un-insulated flue gas connector and an insulated flue gas adaptor to the measurement section in accordance with A.2.4. The clearance distances of combustible materials from the fluepipe shall be as declared in the installation instructions and, where the use of protective shields are specified in the installation instructions, then these shall also be installed in accordance with the installation instructions.

The flue gases shall be extracted from the top of the measurement section and a means of adjustment shall be provided to enable a constant flue draught pressure as specified in the relevant test procedures to be maintained in the measurement section (e.g. by an extraction fan).

NOTE Examples of typical installations are given in Figures A.2 and A.3.




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### A.2.2 Sauna test room

The sauna test room is shown in Figure A.1 and has adjustable dimensions. The ceiling height can be adjusted to 1 900 mm, 2 100 mm or 2 300 mm and depends upon the minimum vertical distance marked on the sauna stove. The width shall be 2 500 mm and the length shall be adjustable by moving one of the walls. If a smaller sauna room is required, a partition wall having a length of 1 200 mm shall be installed.

The walls, ceiling and floor of the sauna room are made of plywood approximately 20 mm thick. The walls and the ceiling are insulated using insulation having a thermal resistance of 1,875 $m^2K/W$ to 2,5 $m^2K/W$. The floor shall be installed 30 mm above the supporting surface.

The sauna room shall be ventilated by air having a temperature of (20 ± 5) °C passing through an inlet opening in the fixed wall. The opening shall be at floor level and have dimensions of 150 mm by 150 mm. The opening can be moved in the horizontal direction so that it shall be located symmetrically behind the sauna stove. An air outlet having approximately the same area shall be positioned in the opposite wall 300 mm below the ceiling and at least 1 000 mm from the fixed wall. Forced ventilation shall be used to provide six air changes per hour.

The maximum surface temperatures of the walls and ceiling shall be determined. The floor temperature under the sauna stove shall also be measured if it is claimed that the sauna stove can be assembled on a combustible base.

These maximum surface temperatures shall be measured using calibrated equipment meeting the accuracy requirements specified in A.3. A sufficient number of measurement points shall be located in and around the hottest zone which shall be fitted with calibrated thermocouples to be used for measurement purposes. The number and location of these calibrated thermocouples shall be sufficient to ensure that the maximum surface temperature achieved shall be recorded. Each thermocouple shall be secured so that its junction is level with the surface on which it is mounted. An example is given in Figure A.4.

NOTE Other measurement equipment can be used instead of thermocouples provided it is ensured that the actual maximum surface temperatures are measured and recorded and that the equipment used shall be calibrated such that it meets the accuracy requirements specified in A.3.

Temperature rises in front and sides of the sauna stove shall be measured by a movable wooden rod placed vertically on the floor. The rod shall have dimensions of (20 ± 2) mm by (20 ± 2) mm and be of sufficient length to extend at least 400 mm above the highest point of the stove. The distance between the rod and the heater shall be the minimum distance from combustibles declared in the installation instructions or marking. The wooden rod shall be as shown in Figure A.8.

For the performance test at nominal heat output in accordance with A.4.6, the size of the test room shall be set to the maximum appropriate to the size of the room as claimed in the installation instructions. For the safety test in accordance with A.4.7, the dimensions of the sauna test room shall be set to the minimum to give the smallest size of test room, e.g. 8 $m^3$.

### A.2.3 Measurement section

#### A.2.3.1 General arrangement

The constructional details and general arrangement of the measurement section shall be as illustrated in Figure A.5.

The measurement section shall be provided with means of measuring the temperature and composition of the flue gas and also with means to measure the static pressure as detailed in A.2.3.2 to A.2.3.4.

The measurement section shall be fully lagged with 40 mm thick mineral fibre or similar material in order to provide a thermal conductivity of 0,04 W/m.K at an average temperature of 20 °C. The dimensions of the measurement section shall be as detailed in Figures A.6 and A.7 and shall be sized in accordance with the diameter of the flue spigot/socket of the appliance.




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#### A.2.3.2 Flue gas temperature measurement

The flue gas temperature shall be measured by a sensing element, e.g. a thermocouple located inside a suction pyrometer as shown in Figure A.5, with the sealed end touching the opposite wall of the measurement section and with the open outlet end connected to a suction pump. The thermocouple shall be protected by a sheath. A suitable fitting shall be provided to give a gas-tight seal between the suction pyrometer and the wall of the measurement section and between the sensing element and the outlet of the pyrometer.

The suction pyrometer probe shall have 3 sampling holes each within (2,5 ± 0,5) mm in diameter, one positioned at the centre of the measurement section and the other two positioned either side at one quarter of the flue diameter distance from the side walls of the measurement section. The extremity of the temperature sensing element shall be placed at the position shown in Figure A.5.

The inside diameter of the suction pyrometer shall be (5 ± 1) mm and the flow rate shall be adjusted in order to obtain a flow velocity within the range of 20 m/s to 25 m/s or lower if it is ensured that the maximum temperature is achieved.

NOTE The high flow rate necessary to achieve the specified range of flow velocity can be limited through the flue gas analysers by use of a bypass arrangement.

#### A.2.3.3 Flue gas sampling

The suction pyrometer probe shall be used for flue gas sampling. The outlet of the suction pyrometer probe shall be connected to a flue gas analysis system meeting the uncertainty of measurement specified in A.3. Means of cooling, cleaning and drying the flue gas sample shall be incorporated in the sampling line. The materials used for the gas sampling line and probe connections shall be resistant to the expected temperature and shall not react with or allow diffusion of flue gases. There shall be no leaks in either the sampling probe connections or the gas sampling line.

#### A.2.3.4 Static pressure measurement

A tube with a nominal internal diameter of 6 mm shall be located into the measurement section as shown in Figure A.5. The end of the tube shall be sealed flush with the inner wall of the measurement section.

### A.2.4 Connection of appliance to measurement section

The appliance flue spigot/socket shall be connected to the measurement section specified in A.2.3 by an uninsulated flue gas connector and an insulated flue gas adaptor. The flue gas connector shall be made of unpainted mild steel with a thickness of (1,5 ± 0,5) mm. Its length shall be (330 ± 10) mm and correspond to the diameter of the flue spigot/socket of the appliance.

The flue gas adaptor shall be connected between the measurement section and the flue gas connector. The flue gas adaptor shall have the same diameter as the measurement section and shall be insulated to the same level as detailed in A.2.3.1.

For appliances with a non-circular outlet or with a diameter different from that of the measurement section, the flue gas connector shall be an adaptor, which accommodates the necessary changes in the shape and/or dimensions to match the measurement section diameter.

For appliances with horizontal outlet, the flue gas adaptor shall have a radius of (225 ± 5) mm at its centre. For appliances with vertical outlet, the flue gas adaptor shall be straight and of length (350 ± 10) mm.

NOTE Some general arrangements are shown in Figures A.2 to A.3.




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## A.3 Measurement equipment

The measurement equipment used shall be selected to ensure that for each measurement parameter the uncertainty requirements specified in Table A.1 are met. The peak value of the parameter to be measured shall be in the measurement range of the measurement equipment used.

**Table A.1 – Uncertainty of measurement**

| Parameter measured | Uncertainty of measurement |
|---|---|
| Gas analysis | |
| CO | ≤ 6 % of the measurement range |
| $CO_2$ | ≤ 2 % of the measurement range |
| $O_2$ | ≤ 2 % of the measurement range |
| Temperature | |
| Flue gas | ≤ 5 K |
| Sauna test room | ≤ 2 K |
| Ambient | ≤ 2 K |
| Surface | ≤ 2 K |
| Touchable Area | ≤ 2 K |
| Cross-draught | ≤ 0,2 m/s |
| Static pressure | ≤ 2 Pa |
| Mass | |
| Fuel load ≤ 7,5 kg | ±5 g |
| > 7,5 kg | ±10 g |

## A.4 Test procedures

### A.4.1 Appliance installation

The appliance shall be installed into the test assembly as specified in A.2.1, in accordance with the appliance installation instructions, and the appliance flue spigot/socket shall be connected to the measurement section as specified in A.2.4.

If the multi-firing sauna stove is supplied in individual parts, the constructional specifications as given in the installation instructions shall be followed during assembly. The mass and placement of the stones shall be in accordance with the installation instructions and any water container for personal washing shall be fitted and filled as per instructions.

Where a flue draught regulator is fitted between the firebed and the flue spigot/socket, then, for the performance test at nominal heat output, either the regulator shall be removed and the opening sealed with a suitably sized solid plate or the regulator itself shall be sealed, e.g. with heat resistant tape so as to avoid the ingress of air through the regulator opening.

### A.4.2 Fuel load

The initial fuel load and the number and mass of the refuel loads for each firing regime shall be in accordance with instructions as detailed in 6.5.




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### A.4.3 Fuelling and de-ashing the fire

Select and prepare the test fuel in accordance with Annex B.

Refuel in accordance with the appliance manufacturer's refuelling instructions and take account of any recommendations regarding general orientation as well as log size.

### A.4.4 Flue gas losses

#### A.4.4.1 General

Calculate the flue gas losses from the composition and temperature of the flue gases in accordance with A.6.

The composition and temperature of the flue gases and the ambient room temperature shall be measured as specified in A.4.4.2 and A.4.4.3.

#### A.4.4.2 Composition of the flue gas

Measure the concentration of the products of combustion ($CO_2$ or $O_2$ and CO) either continuously or at intervals not exceeding 1 min using calibrated instruments meeting the uncertainty of measurement requirements specified in A.3. Determine the mean values of concentration of the products in the dry flue gas as specified in A.6.

#### A.4.4.3 Sauna test room, ambient room and flue gas temperatures

Measure sauna test room, ambient room and flue gas temperatures using calibrated instruments that meet the uncertainty of measurement requirements specified in A.3.

Measure and record these temperatures either continuously or at intervals not exceeding 1 min.

At the end of the test period, calculate and record the mean ambient room temperature and the mean flue gas temperature as specified in A.6.

### A.4.5 Combustible heat losses in the residue

The percentage of heat loss in the residue shall be taken as 0,5 % points of efficiency.

### A.4.6 Performance test at nominal heat output

#### A.4.6.1 General

This test shall be conducted in the largest size sauna test room as specified in A.2.2.

The performance test at nominal heat output shall consist of two parts:

— an ignition and pre-test period,

— a test period.

The duration of the pre-test period shall be sufficient to ensure that normal working conditions and a basic firebed are established and shall be undertaken with the fuel loading declared in the operating instructions as detailed in A.4.2.

Observe the static pressure throughout the entire test and, if necessary, adjust the applied flue draught so that the static pressure is set to the appropriate normal flue draught value ±2 Pa as detailed in 6.4.

The mass and placement of the stones shall be in accordance with the manufacturer's instructions and any water vessel shall be filled as per the manufacturer's instructions. If the appliance is fitted with a water vessel, it shall be filled with water according to the manufacturer's instructions.

After testing, a visual inspection of the water vessel shall be carried out for possible damage. There shall be no visible damage.

#### A.4.6.2 Ignition and pre-test period

Start the flue gas extraction system and adjust the applied draught so that the static pressure in the measurement section shall be set to the normal draught for the appliance as detailed in 6.4, or such other value as given in the appliance installation instructions.

Load the appliance with sufficient test fuel to ensure ignition of the fuel in accordance with the appliance manufacturer's instructions. When the fuel is well alight, load the appliance with the mass of test fuel in accordance with A.4.2.

Adjust the applied flue draught to give the appropriate static pressure in the measurement section. Set the combustion control devices to the required setting in order to achieve the burning condition necessary to give the claimed nominal heat output.

Operate the appliance during the pre-test period at a burning rate which gives the claimed nominal heat output whilst ensuring at least the mass of basic firebed remains at the end of this period.

End the ignition and pre-test period when the level of the $CO_2$ in the flue gas has fallen to 4,0 % which indicates that the mass of basic firebed is achieved.

#### A.4.6.3 Test period

Load the appliance with the mass of test fuel declared by the manufacturer as detailed in A.4.2. If, as specified in the operating instructions by the manufacturer, the fuel can be added as batch charges, then a further batch or batches of test fuel shall be added at the specified durations.

The test period shall start immediately after loading the appliance.

Measure and record the temperature and the composition of flue gas as described in A.4.4.3.

Measure and record the temperature of the ceiling and walls (and floor if necessary) either continuously or at regular intervals of not more than 1 min to ensure that the maximum temperatures achieved are recorded. Measure and record the surface temperatures of any operating knobs intended to be operated without the use of a tool; the outside surface temperature of any protection shields (if fitted) and the temperature in the fuel storage container (if fitted) for the entire test to ensure the maximum temperatures reached by the knobs, protection shields and storage container are accurately recorded. The rod temperature in front of and at the sides of the stove should also be measured.

End the test period when the number of test fuel loads in accordance with A.4.2 have been added and the reading of the $CO_2$ in the flue gases has fallen to 4,0 %. Record, in minutes, the duration of the test period.

The actual measured test duration in at least one of the tests shall equal or exceed the minimum declared refuelling interval as detailed in 6.5. Also the actual measured nominal heat output in at least one of the tests shall equal or exceed the declared nominal heat output.

If, within a tolerance of 15 %, the actual test duration is shorter or longer than either the minimum duration specified in 6.5, then determine by way of a comparative calculation whether, at the declared nominal heat output, the required minimum test duration would theoretically have been achieved or whether, at the minimum declared test duration, the declared nominal heat output would theoretically have been achieved.

If either the calculated test duration or the calculated nominal heat output does not meet the requirements, the test is invalid (and is designated as a pre-test) and a further test period shall be undertaken.




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## A.4.7 Temperature safety test

### A.4.7.1 General

This test shall be conducted in the smallest size sauna test room as specified in A.2.2 and shall consist of the following two parts:

— an ignition and pre-test period(s),

— a test period.

All controls, except those used only for start-up purposes, shall be set in a position that allows the highest heat output to be achieved.

### A.4.7.2 Ignition and pre-test period

Start the flue gas extraction system and adjust the applied draught to give a static pressure within ± 2 Pa of the flue draught used in the nominal heat output test.

Load the appliance with sufficient test fuel to ensure ignition of the fuel in accordance with the appliance manufacturer's instructions. Begin the test period once the sauna test room temperature has first exceeded 60 °C and then levelled out at 60 °C.

### A.4.7.3 Test period

The test period shall directly follow the ignition and pre-test period once the temperature has levelled out at 60 °C. Sufficient mass of test fuel shall be added to fill the appliance to maximum and the air controls shall be set to the maximum opening to give the highest burning rate. The flue draught shall be increased to 3 Pa greater than that used for the nominal heat output test and shall be maintained within $\binom{+2}{0}$ Pa of this value.

NOTE Filling the appliance to its maximum means filling up to the upper level of the firebox opening in the configuration given in the operating instructions.

Observe the static pressure and adjust the applied flue draught, if necessary, to keep the static pressure within $\binom{+2}{0}$ Pa of the appropriate test value.

Measure and record, either continuously or at regular intervals of not more than 1 minute, the following parameters:

— The temperatures on the ceiling and the walls (and floor if necessary) of the sauna test room,

— The temperature in the fuel storage container (if fitted),

— The wooden rod temperature in front of and at the sides of the sauna stove. If protection shields are installed in accordance with the installation instructions, then the outside surface temperature of the shield shall also to be measured.

The sauna test room temperature shall rise to at least 110 °C. If the first filling of wood is not sufficient to achieve this temperature, then further amounts of wood shall be added until this temperature is reached.

End the test period when the reading of the $CO_2$ level in the flue gas after the last fuel addition reaches 4,0 %. Record the maximum temperatures achieved.

## A.5 Test results

Calculate and record from at least two valid tests results, in accordance with A.6, the following parameters at nominal heat output:

— The mean total efficiency;

— The mean nominal heat output;

— The mean nominal heat to space;

— The mean CO emission at 13 % $O_2$;

— The mean flue gas temperature.

The mean value for the nominal heat output calculated from at least two separate valid tests shall be not less than the declared value. For each separate test result to be valid, it shall not differ from the mean value by more than ±10 %.

Record also the test values of the individual measurements used in the calculations and the flue draught used for each test.

Record the total heat output and the actual test duration measured during the tests at nominal heat output. If, within a tolerance of 15 %, the actual test duration is shorter or longer than the minimum duration specified in 6.5, then determine by way of a comparative calculation whether, at the declared nominal heat output, the minimum test duration would theoretically have been achieved or whether, at the minimum declared test duration, the declared nominal heat output would theoretically have been achieved. If appropriate, record either the revised test duration or the recalculated nominal heat output.

Record the maximum surface temperature achieved on every operating knob intended to be operated without the use of a tool. Record the maximum temperatures of the ceiling, walls and the floor (if needed). Also record the maximum temperature achieved in any integral fuel store, if fitted, and the maximum outside surface temperature of any protective shield, if fitted.

Record whether the materials, design and constructional requirements specified in Clause 4 were met. Record whether the manufacturer's instructions for the appliance met the requirements specified in Clause 7 and whether the marking and labelling of the appliance met the requirements specified in Clause 9.

NOTE Actual measured values of dimensions, thickness etc. together with supporting certificates and documentation should also be recorded.

## A.6 Calculation methods

### A.6.1 Notations and units used

The notations and units used in the calculations shall be as given in Table A.2.

**Table A.2 — Notations and units used in calculations**

| Notation | Definition | Unit |
|---|---|---|
| $B$ | Mass of the test (as fired basis) | kg |
| $b$ | Combustible constituents in residues referred to mass of residues | % of mass |
| $C_r$ | $C_r$ is carbon content in residues.<br>NOTE When burning wood logs, $C_r = 1{,}4925 \times H_u \times 10^{-5}$. | % of mass |
| $C$ | Carbon content of test fuel (as fired basis) | % of mass |




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| | | |
|---|---|---|
| $CO$ | Carbon monoxide content of the dry flue gases | % of volume |
| $CO_2$ | Carbon dioxide content of the dry flue gases | % of volume |
| $C_{pmd}$ | Specific heat of dry flue gases in standard conditions, depending on temperature and composition of the gases | kJ / K. $m^3$ |
| $C_{pmH2O}$ | Specific heat of water vapour in flue gases in standard conditions, depending on temperature | kJ / K. $m^3$ |
| $H$ | Hydrogen content of the test fuel (as fired basis) | % of mass |
| $H_u$ | Lower calorific value of the test fuel (as fired basis)<br>NOTE The lower calorific value of the test fuel on an as fired basis can be calculated from net calorific value on a dry basis using the formula:<br>$H_u = H_{uf}$ *x (100 - W)/100 - 24,43 x W [in kJ/kg]* | kJ / kg |
| $H_{uf}$ | Lower calorific value of the test fuel (dry basis) | kJ / kg |
| $m_f$ | Flue gas mass flow | g / s |
| $\eta$ | Efficiency | % |
| $P$ | Total heat output | kW |
| $P_{sp}$ | Space heat output | kW |
| $C_{p,w}$ | Specific heat of water | kJ/kg, K |
| $Q_a$ | Thermal heat losses in the flue gases, referred to the unit of mass of the test fuel | kJ/kg |
| $Q_b$ | Chemical heat losses in the flue gases, referred to the unit of mass of the test fuel | kJ/kg |
| $Q_r$ | Heat losses through combustible constituents in the residue referred to the unit of mass of the test fuel (as fired basis) | kJ/kg |
| $q_a$ | Proportion of losses through specific heat in the flue gases $Q_a$, referred to the calorific value in the test fuel (as fired basis) | % |
| $q_b$ | Proportion of losses through latent heat in the flue gases $Q_b$, referred to the calorific value in the test fuel (as fired basis) | % |
| $q_r$ | Proportion of heat losses through combustible constituents in the residues $Q_r$, referred to the calorific value of the test fuel | % |
| $T_t$ | Test time of nominal heat output test | s |
| $t_a$ | Flue gas temperature | °C |
| $t_r$ | Ambient temperature | °C |
| $V_{con}$ | Volume, at NTP, of carbon monoxide | $dm^3$ |
| $W$ | Water content of the test fuel (as fired basis) | % of mass |
| $A$ | Stoichiometric oxygen demand for the fuel | mol $O_2$/mol fuel |
| $c$ | Carbon content of the fuel (on dry ash free basis) | kg/kg |
| $h$ | Hydrogen content of the fuel (on dry ash free basis) | kg/kg |
| $o$ | Oxygen content of the fuel (on dry ash free basis) | kg/kg |
| $s$ | Sulphur content of the fuel (on dry ash free basis) | kg/kg |
| $m_h$ | Molar content of hydrogen | |
| $m_s$ | Molar content of sulphur | |
| $m_o$ | Molar content of oxygen | |




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## A.6.2 Formulae

### A.6.2.1 Heat losses and efficiency

#### A.6.2.1.1 General

The heat losses shall be determined from the mean values of flue gas and room temperatures, the flue gas composition and the combustible constituents in the residue.

The efficiency shall be determined from these losses using the formula:

$$\eta = 100 - (q_a + q_b + q_r) \quad \text{(A.1)}$$

As the test fuel is wood logs only, then the heat loss in the residue ($q_r$) shall be taken as 0,5 % points of efficiency in accordance with A.4.5 then the value of $C_r$ in Equation (A.3) and Equation (A.5) below shall be calculated as follows:

$$C_r = 1{,}4925 \times H_u \times 10^{-5} \quad \text{(A.2)}$$

#### A.6.2.1.2 Thermal heat losses in the flue gas

The thermal heat losses in the flue gas shall be determined as follows:

$$Q_a = (t_a - t_r) \times [\,[(C_{pmd} \times (C - C_r)) / (0{,}536 \times (CO + CO_2))] + [C_{pmH2O} \times 1{,}244 \times (9H + W) / 100]\,] \quad \text{(A.3)}$$

$$q_a = 100 \times Q_a / H_u \quad \text{(A.4)}$$

#### A.6.2.1.3 Chemical heat losses in the flue gas

The chemical heat losses in the flue gas shall be determined as follows:

$$Q_b = 12\,644 \times CO \times (C - C_r) / [\,0{,}536 \times (CO_2 + CO) \times 100\,] \quad \text{(A.5)}$$

$$q_b = 100 \times Q_b / H_u \quad \text{(A.6)}$$

#### A.6.2.1.4 Heat losses due to combustible constituents in the residue

The percentage of heat loss in the residue shall be taken as 0,5 % points of efficiency.

### A.6.2.2 Total heat output

The total heat output shall be calculated from the mass of fuel consumed each hour, the calorific value of the test fuel and the efficiency, using the formula:

$$P = (\eta \times B \times H_u) / (100 \times 3\,600) \quad \text{(A.7)}$$

### A.6.2.3 Space heat output

The space heat output shall be declared as the calculated total heat output in accordance with A.6.2.2.

### A.6.2.4 Flue gas mass flow

The flue gas mass flow shall be determined as an approximate value from the $CO_2$ content of the flue gases and the fuel-specific data, using the formula:

$$m_f = [\,B \times (1{,}3) \times (C\text{-}C_r) / (\,(0{,}536) \times (CO_2 + CO)) + (9H + W) / 100\,] / 3{,}6 \quad \text{(A.8)}$$

#### A.6.2.5 CO content at 13 % oxygen

The mean values of the flue gas components such as oxygen, carbon dioxide and carbon monoxide over the test period shall be calculated as an allowable approximation of the data received from the instrument readings.

NOTE With this calculation method, the mean values of the components are not weighted for possible fluctuations in mass flow over the test period, as the flue gas flow is assumed to be constant and the calculation errors are deemed to be small.

The CO content shall be calculated as follows:

a) The mean carbon monoxide value $CO_{avg}$ shall be calculated as the mean value of all CO data acquired from the instrument readings over the test period.

b) The $CO_{avg}$ value shall be converted to the CO content value based on a standard oxygen content in the flue gas according to one of the following formulae:

$$CO\ content = CO_{\text{avg}} \times \frac{[21 - O_{2\text{standardized}}]}{[21 - O_{2\text{avg}}]} \tag{A.9}$$

$$CO\ content = CO_{\text{avg}} \times \frac{CO_{2\ \max}}{CO_{2\text{avg}}} \times \frac{[21 - O_{2\text{standardized}}]}{21} \tag{A.10}$$

For this standard, the standardized oxygen content ($O_{2standardized}$) in the flue gas shall be taken as 13 %. The value of $CO_{2max}$ shall be calculated as detailed in A.6.2.8.

#### A.6.2.6 Specific heat value of the combustion products

##### A.6.2.6.1 Specific heat of dry flue gases in standard conditions ($C_{pmd}$)

The specific heat of the dry flue gases in standard conditions ($C_{pmd}$) shall be calculated using the formula:

$$\begin{aligned} C_{pmd} = {} & 3{,}6 \times \left( 0{,}361 + 0{,}008 \times \left( \frac{t_a}{1000} \right) + 0{,}034 \times \left( \frac{t_a}{1000} \right)^2 \right) \\ & + \left( 0{,}085 + 0{,}19 \times \left( \frac{t_a}{1000} \right) - 0{,}14 \times \left( \frac{t_a}{1000} \right)^2 \right) \times \left( \frac{CO_2}{100} \right) \\ & + \left( 0{,}3 \times \left( \frac{t_a}{1000} \right) - 0{,}2 \times \left( \frac{t_a}{1000} \right)^2 \right) \times \left( \frac{CO_2}{100} \right)^2 \end{aligned} \tag{A.11}$$

##### A.6.2.6.2 Specific heat of water vapour ($C_{pmH20}$)

The specific heat of the water vapour ($C_{pmH20}$) in the combustion products shall be calculated using the equation:

$$C_{\text{pmH2O}} = 3{,}6 \times \left( 0{,}414 + 0{,}038 \times \left( \frac{t_a}{1000} \right) + 0{,}034 \times \left( \frac{t_a}{1000} \right)^2 \right) \tag{A.12}$$

#### A.6.2.7 Volume, at NTP, of carbon monoxide ($V_{COn}$)

The volume, at NTP, of the carbon monoxide ($V_{COn}$) during the safety test shall be calculated in $dm^3$ according to the following formula:

$$V_{COn} = \frac{C \times F}{0{,}536 \times (CO_2 + CO)} \times CO \times 10 \quad \text{(A.13)}$$

#### A.6.2.8 Calculation of $CO_{2max}$

The value of $CO_{2max}$ used in Equation (A.10) shall be calculated as follows:

$$CO_{2\,max} = \frac{1}{[1 + m_s + A \times (79/21]} \quad \text{(A.14)}$$

The values of $A$ and $m_s$ used in Equation (A.14) shall be calculated as follows:

$$A = 1 + (m_h/4) - (m_o/2) + m_s \quad \text{(A.15)}$$

$$m_s = (12/32) \times (s/c) \quad \text{(A.16)}$$

where:

$$m_h = 12 \times (h/c) \quad \text{(A.17)}$$

$$m_o = (12/16) \times (o/c) \quad \text{(A.18)}$$

NOTE The ultimate analysis of the fuel is necessary for these calculations so that the content of carbon, hydrogen, sulfur and oxygen on a dry, ash free basis are known.

## A.7 Test report

Each page of the test report shall be numbered consecutively and shall specify the results of the test work and any other additional information and shall contain at least the following details concerning the test work undertaken on the appliance:

— Name and address of the appliance manufacturer;

— Name, serial number and description of the appliance;

— Statement describing whether the materials, design and construction requirements specified in Clause 4 are met or failed, supported by actual measured values of dimensions, thicknesses, etc. together with certificates as appropriate;

— Statement describing whether the safety requirements specified in Clause 5 and performance requirements specified in Clause 6 are met or failed, supported by detailed test results as specified in A.5;

— Statement describing whether the installation and operating instructions comply with the requirements specified in Clause 7;

— Copy of the marking information given on the appliance, and a statement whether the marking information complies with the requirements specified in Clause 9;

— Name and address of the test laboratory;

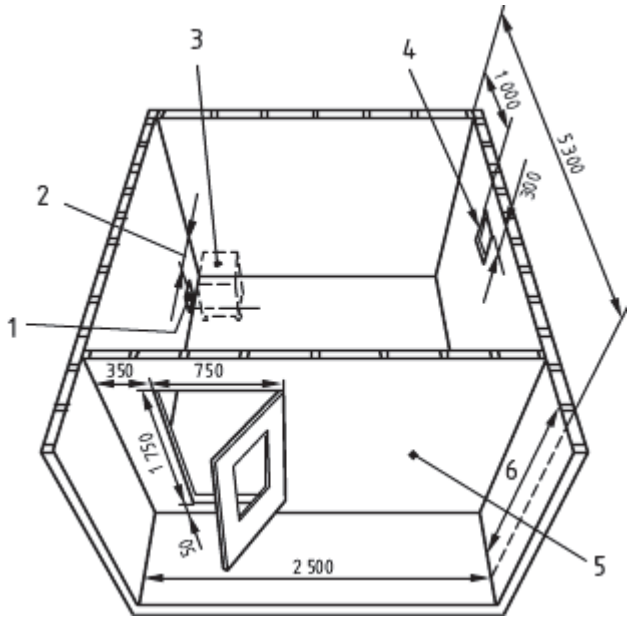
— Unique serial number of the test report;

— Date of issue of the report;

— Signature and legible name of the person taking responsibility for the content of the report;

— Analysis and specifications of the test fuels used during the test work.

Dimensions in millimetres

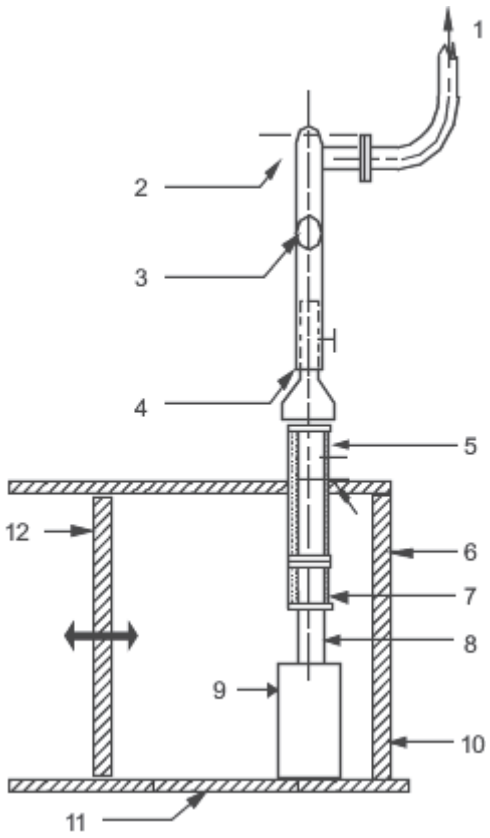



**Key**

1 Air inlet
2 Adjustable distance
3 Sauna stove
4 Air outlet
5 Movable wall
6 1 900 mm, 2 100 mm or 2 300 mm

NOTE Sauna test room also includes a ceiling which is not shown.

**Figure A.1 — View of sauna test room showing general arrangement of walls and test hearth**



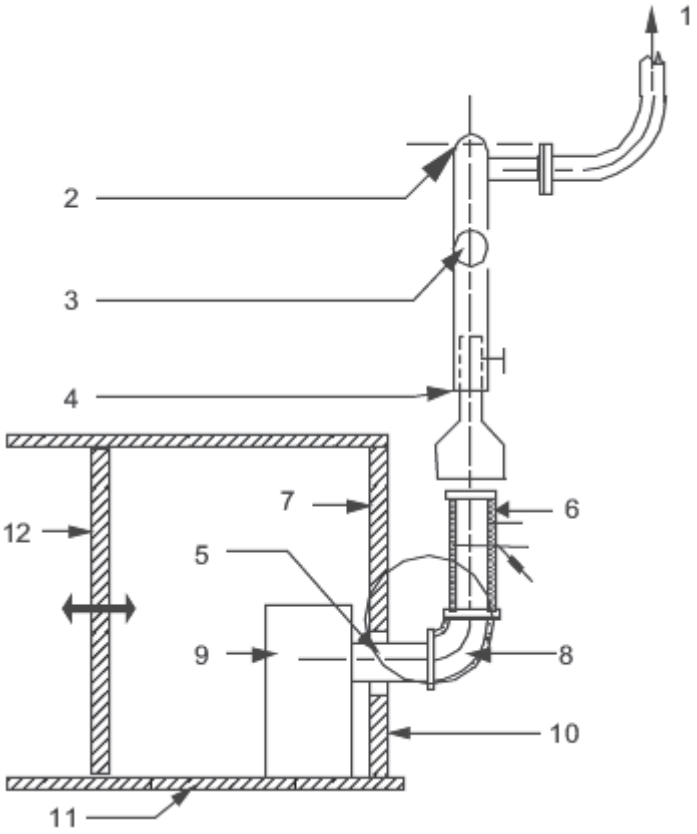

**Key**

| | | | |
|---|---|---|---|
| 1 | Exhaust to atmosphere | 7 | Flue gas adaptor - straight |
| 2 | Fan | 8 | Flue gas connector |
| 3 | Adjustable damper | 9 | Appliance |
| 4 | Adjustable gather | 10 | Side wall(s) of sauna test room |
| 5 | Measurement section | 11 | Sauna test room floor |
| 6 | Side wall(s) of sauna test room | 12 | Movable wall |

NOTE The flue gas connector goes through an opening in the sauna test room ceiling and is insulated. Only 330 mm is uninsulated.

**Figure A.2 — Example of installation of an appliance with vertical flue outlet in the test assembly**

Dimensions in millimetres
Tolerance on dimensions ±1 mm



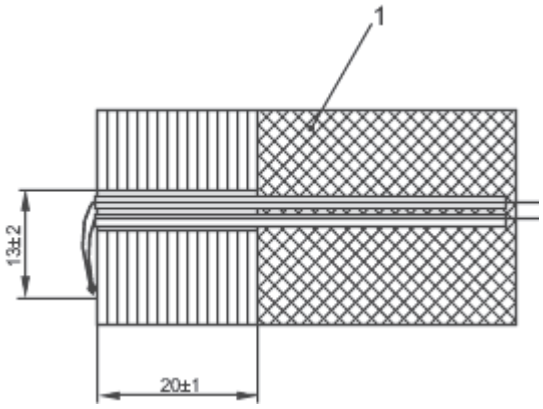

**Key**

| | | | |
|---|---|---|---|
| 1 | Exhaust to atmosphere | 7 | Side wall(s) of sauna test room |
| 2 | Fan | 8 | Flue gas adaptor - bend |
| 3 | Adjustable damper | 9 | Appliance |
| 4 | Adjustable gather | 10 | Side wall(s) of sauna test room |
| 5 | Flue gas connector | 11 | Sauna test room floor |
| 6 | Measurement section | 12 | Movable wall |

NOTE The horizontal flue outlet goes through the side wall of sauna test room and is insulated in the wall.

**Figure A.3 — Example of installation of an appliance with horizontal flue outlet**

Dimensions in millimeters

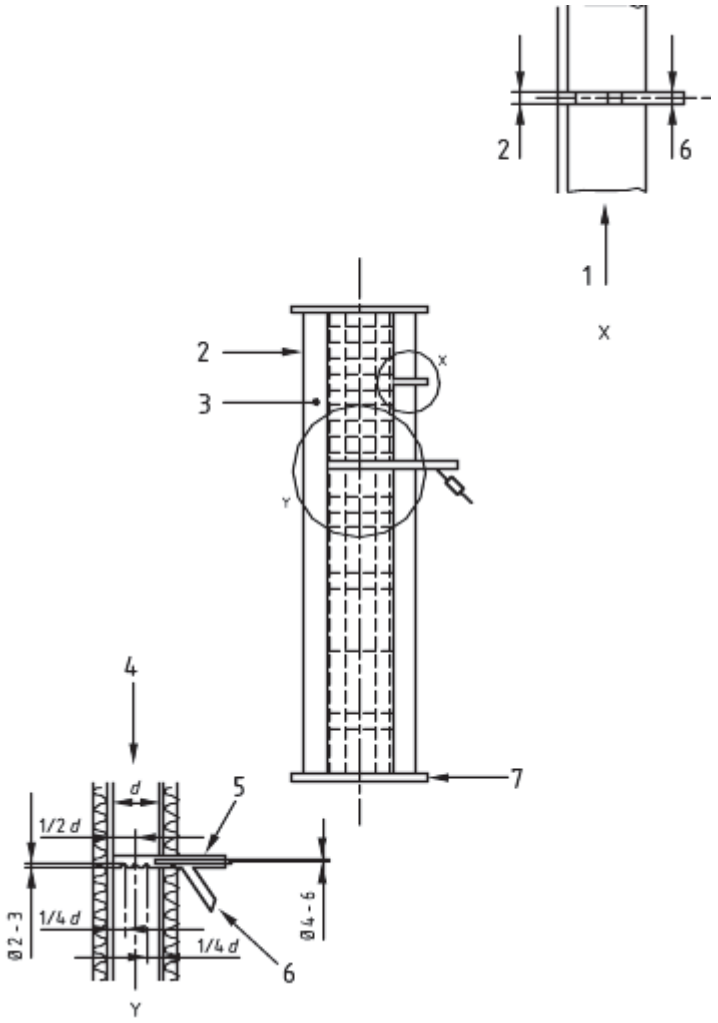



**Key**

1 Sauna test room wall

**Figure A.4 — Detail of thermocouples in sauna test room wall and ceiling**

Dimensions in millimetres

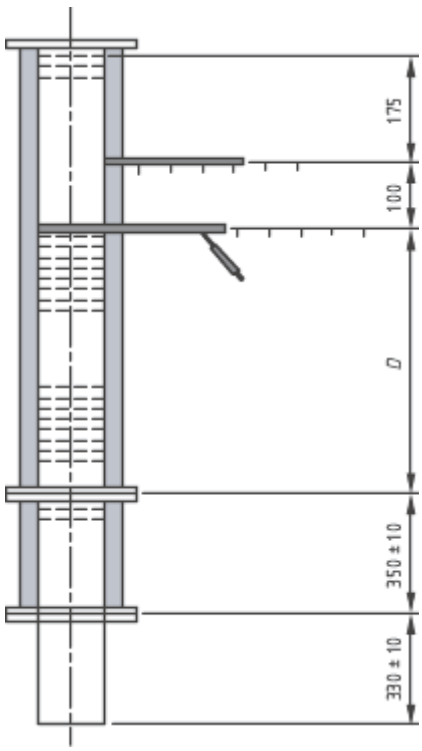



**Key**

1 Static pressure measurement
2 Measurement section
3 Insulation
4 Measurement of flue gas temperature and constituents
5 Outlet for sensing element
6 Outlet for flue gas sampling
7 Flange

**Figure A.5 — Construction and general arrangement of measurement section**

Dimensions in millimetres
Tolerance on dimensions ±1 mm
except where shown otherwise



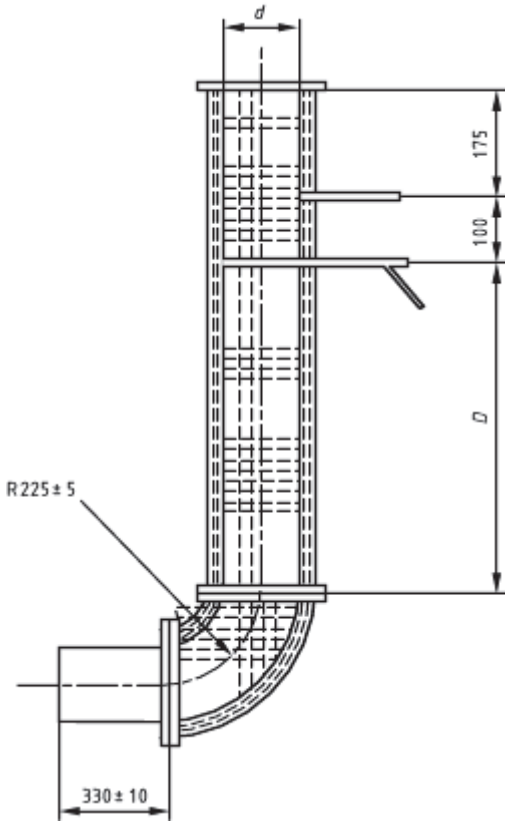

**Key**

Dimensions of measurement sections

| **Flue spigot/socket diameter Ø** (mm) | ***d*** | ***D*** |
|---|---|---|
| ≤ 180 | 150 | 750 |
| 180 < Ø ≤ 250 | 200 | 1 000 |
| > 250 | 300 | 1 500 |

**Figure A.6 — Details and dimensions of measurement section for vertical flue outlet**

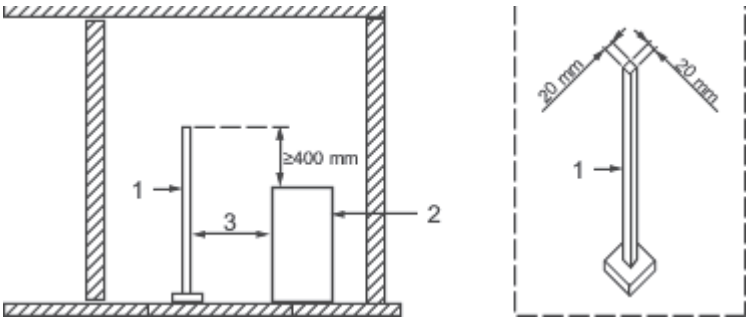
Dimensions in millimetres
Tolerance on dimensions ±1 mm
except where shown otherwise




Dimensions of measurement section

| **Flue spigot/socket diameter Ø** (mm) | ***d*** | ***D*** |
|---|---|---|
| ≤ 180 | 150 | 750 |
| 180 < Ø ≤ 250 | 200 | 1 000 |
| > 250 | 300 | 1 500 |

**Figure A.7 — Details and dimensions of measurement section for horizontal flue outlet**




**Key**

1 The wooden rod
2 The appliance
3 Safety distance from the appliance

**Figure A.8 — Wooden rod to measure temperatures inside the sauna test room in front and from sides of the appliance to determine safety distances**

# Annex B
(normative)

# Test fuels and recommended fuels

## B.1 General

The standardised test fuels and their various specifications as detailed in Table B.1, representing each of the various types of commercially available fuels, shall be used as the respective test fuel when undertaking the thermal testing of an appliance against the performance requirements of this standard.

Selection, preparation and analysis of the test fuel shall be in accordance with the methods described in B.2.

As specified in 7.3, it is the responsibility of the appliance manufacturer to declare in the appliance operating instructions the types of commercially available fuels recommended for use in the multi-firing sauna stove.

## B.2 Test fuel

### B.2.1 Selection of test fuel

Based upon the number of types of commercial fuels recommended in the operating instructions, the appropriate test fuel(s) shall be selected which lie within the specifications given in Table B.1 corresponding to the recommended commercial fuels as given in Table B.2. The size grading of the test fuel shall be in accordance with that specified in the operating instructions.

### B.2.2 Storage, preparation and analysis

Each batch of test fuel shall be stored under cover. When sampled and analysed in accordance with the appropriate test method, specified in Table B.1, each batch of test fuel used shall conform to the appropriate test fuel specification as given in Table B.1.

Where the measured moisture content exceeds the specification given in Table B.1, the test fuel shall be air dried until the moisture content meets the specification.

The test fuel used shall meet the appropriate test fuel specifications given in Table B.1. The analysis and specification of the test fuel(s) used shall be given in the test report.

NOTE The analysis may be guaranteed by a supplier's declaration of analysis.




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**Table B.1 — Test fuel specifications**

| **Test fuel designation and analysis method** | **Wood logs**<br>**Beech, birch or hornbeam** |
|---|---|
| Moisture content (as fired basis)<br>EN 14774-1 | (16 ± 4) % |
| Ash content (as fired basis)<br>EN 14775 | < 1% |
| Volatile matter<br>EN 15148 | (84 ± 4) % |
| Hydrogen content (as fired basis)<br>EN 15104 | (5 ± 1) % |
| Carbon content (as fired basis)<br>EN 15104 | (40 ± 5) % |
| Nitrogen content (as fired basis)<br>EN 15104 | < 0,2 % |
| Sulfur content (as fired basis)<br>EN 15289 | < 0,1 % |
| Gross (higher) calorific value of dry matter<br>EN 14918 | > 17 MJ |
| Net (lower) calorific value (as fired basis)<br>EN 14918 | $H_u = H_{uf}$ x (100 - $W$)/100 - 24,43 x $W$ [kJ/kg] |
| Size, length | according to operating instructions |

**Table B.2 —Typical commercial fuel specifications**

| **Commercial fuel types and analysis method** | **Wood logs** |
|---|---|
| Moisture content (as fired basis)<br><br>EN 14774-1 | 12 % to 25 % |
| Ash content (as fired basis)<br><br>EN 14775 | < 1,5 % |
| Volatile matter<br><br>EN 15148 | 80 % to 88 % |
| Hydrogen content (as fired basis)<br><br>EN 15104 | 4 % to 7 % |
| Carbon content (as fired basis)<br><br>EN 15104 | 35 % to 45 % |
| Nitrogen content (as fired basis)<br><br>EN 15104 | 0,1 % to 1 % |
| Sulfur content (as fired basis)<br><br>EN 15289 | < 0,1 % |
| Gross (higher) calorific value of dry matter<br><br>EN 14918 | 15 000 kJ/kg to 20 000 kJ/kg |
| Net (lower) calorific value (as fired basis)<br><br>EN 14918 | $H_u = (H_{uf} \times (100 - W) /100 - 24{,}43 \times W$ [kJ/kg] |
| Diameter | 5 cm to 10 cm |
| Length | 0,2 m to 1,0 m |
| Designation of standard test fuel to be used | Beech, birch or hornbeam |




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# Annex ZA
(informative)

# Clauses of this European Standard addressing the provisions of the EU Construction Products Directive

## ZA.1 Scope and relevant characteristics

This European standard has been prepared under Mandate M/129 “Space heating appliances”, as amended, given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European standard shown in this Annex meet the requirements of the Mandate given under the EU Construction Products Directive (89/106/EEC).

Compliance with these clauses confers a presumption of fitness of multi-firing sauna stoves fired by natural wood logs covered by this annex for their intended uses indicated herein; reference shall be made to the information accompanying the CE marking.

**WARNING** — Other requirements and other EU Directives, not affecting the fitness for intended use, can be applicable to sauna stoves fired by natural wood logs falling within the scope of this European Standard.

NOTE 1 In addition to any specific clauses relating to dangerous substances contained in this Standard, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

NOTE 2 An informative database of European and national provisions on dangerous substances is available at the Construction web site on EUROPA (CREATE, accessed through http://ec.europa.eu/enterprise/construction/internal/dangsub/dangmain.htm).

This Annex establishes the conditions for the CE marking of multi-firing sauna stoves fired by natural wood logs intended for the uses indicated in Table ZA.1 and shows the relevant clauses applicable.

This Annex has the same scope as Clause 1 of this standard and is defined by Table ZA.1.




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**Table ZA.1 — Relevant clauses**

| **Construction product:** Multi-firing sauna stoves fired by natural wood logs<br>**Intended use:** Space heating in residential buildings | | | |
|---|---|---|---|
| **Essential characteristics** | **Requirement clauses in this European Standard** | **Levels and/or classes** | **Notes** |
| **FIRE SAFETY** (e.g. initiation, risk to adjacent elements), dealt with by: | | | |
| - design, manufacture and assembly | 4.2.1.1 | – | expressed as “Pass” or “Fail” |
| - cleaning of heating surfaces | 4.2.2 | – | expressed as “Pass” or “Fail” |
| - flue spigot or sockets | 4.2.3 | – | expressed as “Pass” or “Fail” |
| - ashpan and ash removal | 4.2.4 | – | expressed as “Pass” or “Fail” |
| - bottomgrate | 4.2.5 | – | expressed as “Pass” or “Fail” |
| - combustion air supply | 4.2.6 | – | expressed as “Pass” or “Fail” |
| - control of flue gas | 4.2.7 | – | expressed as “Pass” or “Fail” |
| - firedoor and charging doors | 4.2.8 | – | expressed as “Pass” or “Fail” |
| - flue bypass device | 4.2.9 | – | expressed as “Pass” or “Fail” |
| - temp. rise of the operating components | 5.1 | – | expressed as “Pass” or “Fail” |
| - temp. of adjacent combustible materials at manufacturer’s specified safety distances | 5.2 | – | expressed as “Pass” or “Fail” |
| **EMISSION OF COMBUSTION PRODUCTS**, dealt with by: | | | |
| - design, manufacture and assembly | 4.2.1.1 | – | expressed as “Pass” or “Fail” |
| - bottomgrate | 4.2.5 | – | expressed as “Pass” or “Fail” |
| - combustion air supply | 4.2.6 | – | expressed as “Pass” or “Fail” |
| - control of flue gas | 4.2.7 | – | expressed as “Pass” or “Fail” |
| - flue bypass device | 4.2.9 | – | expressed as “Pass” or “Fail” |
| - front firebars and/or deepening plate | 4.2.10 | – | expressed as “Pass” or “Fail” |
| **SURFACE TEMPERATURE**[a], dealt with by: | | | |
| - design, manufacture and assembly | 4.2.1.1 | – | expressed as “Pass” or “Fail” |
| - temp. rise of the operating components | 5.1 | – | expressed as “Pass” or “Fail” |
| - temp. of adjacent combustible materials at manufacturer’s specified safety distances | 5.2 | – | expressed as “Pass” or “Fail” |
| **RELEASE OF DANGEROUS SUBSTANCES** | | | see Notes 1 and 2 to ZA.1 |
| **CLEANABILITY**, dealt with by: | | | |
| - design, manufacture and assembly | 4.2.1.1 | – | expressed as “Pass” or “Fail” |
| - cleaning of heating surfaces | 4.2.2 | – | expressed as “Pass” or “Fail” |
| - ashpan and ash removal | 4.2.4 | – | expressed as “Pass” or “Fail” |
| - bottomgrate | 4.2.5 | – | expressed as “Pass” or “Fail” |
| **FLUE GAS TEMPERATURE** | 6.1 | – | tested acc. to A.4.6 and expressed as a declared value (in °C) |
| **MECHANICAL RESISTANCE** (to carry a chimney/flue), dealt with by: | | | |
| - design, manufacture and assembly | 4.2.1.1 | – | expressed as “Pass” or “Fail” |
| - flue spigot or sockets | 4.2.3 | – | expressed as “Pass” or “Fail” |

| | | | |
|---|---|---|---|
| **THERMAL OUTPUT** and **ENERGY EFFICIENCY**, dealt with by: | | | |
| - carbon monoxide emission | 6.2 | – | tested acc. to A.4.6 and expressed as "Pass" or "Fail" against a threshold value of < 1,0 % (at 13 % $O_2$) together with the measured mean value in % |
| - total efficiency | 6.3 | – | tested acc. to A.4.6 and expressed as "Pass" or "Fail" against a threshold value of ≥ 50 % together with the measured mean value in % |
| - flue draught | 6.4 | – | tested acc. to A.4.6 and expressed as a declared value in Pa |
| - refuelling loads | 6.5 | – | tested acc. to A.4.6 and expressed as a declared value in kg |
| - space heating output | 6.6 | - | tested acc. to A.4.6 and expressed as a declared nominal value in kW |
| **DURABILITY** | 4.2.1.2 | – | expressed as "Pass" or "Fail" |
| a Only for surfaces or parts of the product, which are not associated with the heat transmission of heat. | | | |

The requirement on a certain characteristic is not applicable in those Member States (MSs) where there are no regulatory requirements on that characteristic for the intended end use of the product. In this case, manufacturers placing their products on the market of these MSs are not obliged to determine nor declare the performance of their products with regard to this characteristic and the option "No performance determined" (NPD) in the information accompanying the CE marking (see ZA.3) may be used. The NPD option may not be used, however, where the characteristic is subject to a threshold level.

## ZA.2 Procedure for the attestation of conformity of multi-firing sauna stoves fired by natural wood logs

### ZA.2.1 System of attestation of conformity

The system of attestation of conformity of multi-firing sauna stoves fired by natural wood logs indicated in Table ZA.1, in accordance with the decision of the Commission 1999/471/EC of 1999-06-29 (*see OJEU L184 of 1999-07-17*), as amended by 2001/596/EC of 2001-01-08 (*see OJEU L209 of 2001-08-02*), as given in Annex III of the mandate for "Space heating appliances", as amended, is shown in Table ZA.2 for the intended use and relevant level(s) and classes.

**Table ZA.2 — Attestation of conformity system**

| Product | Intended use | Level(s) or class(es) | Attestation of conformity system |
|---|---|---|---|
| Space heating appliances burning solid and liquid fuels | in buildings | - | 3 |
| System 3: See Directive 89/106/EEC (CPD) Annex III.2.(ii), Second possibility. | | | |

The attestation of conformity of multi-firing sauna stoves fired by natural wood logs in Table ZA.1 shall be based on the evaluation of conformity procedures indicated in Table ZA.3 resulting from the application of the clauses of this European Standard indicated therein.

**Table ZA.3 — Assignment of evaluation of conformity tasks for multi-firing sauna stoves fired by natural wood logs under system 3**

| Tasks | | Content of the task | Evaluation of conformity clauses to apply |
|---|---|---|---|
| Tasks under the responsibility of the manufacturer | Factory production control (FPC) | Parameters related to characteristics of Table ZA.1, relevant for the intended use, which performance to be declared | 8.3 |
| | Initial type testing by the manufacturer | Characteristics of Table ZA.1, relevant for the intended use, which performance to be declared, except those tested by notified test lab (see below) | 8.2 |
| | Initial type testing by a notified test laboratory | Performances to be declared for the relevant intended use of the following characteristics of Table ZA.1: Fire safety, Emission of combustion products, Release of dangerous substances (if relevant), Surface temperature, Thermal output/Energy efficiency | 8.2 |

## ZA.2.2 EC declaration of conformity

When compliance with the conditions of this annex is achieved, the manufacturer or his agent established in the EEA shall prepare and retain a declaration of conformity (i.e. EC declaration of conformity), which entitles the manufacturer to affix the CE marking. This declaration shall include:

— Name and address of the manufacturer, or his authorised representative established in the EEA, and place of production;

NOTE 1 The manufacturer may also be the person responsible for placing the product onto the EEA market, if he takes responsibility for CE marking.

— Description of the product (type, identification, use, ...), and a copy of the information accompanying the CE marking;

NOTE 2 Where some of the information required for the declaration is already given in the CE marking, it does not need to be repeated.

— Provisions to which the product conforms (i.e. Annex ZA of this EN);

— Particular conditions applicable to the use of the product (e.g. provisions for use under certain conditions);

— Name and address of the notified laboratory(ies);

— Name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or his authorised representative.

The above mentioned declaration shall be presented in the language or languages of the Member State in which the product is intended to be used.




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## ZA.3 CE marking and labelling

### ZA.3.1 General

The manufacturer or his authorized representative established within the EEA is responsible for the affixing of the CE marking, which consists of the CE-marking symbol, as given by Directive 93/68/EEC, and the appropriate accompanying information.

### ZA.3.2 CE marking on the product

The following information shall accompany the CE-marking symbol and be affixed on each multi-firing sauna stove fired by natural wood logs:

a) Name or identifying mark of the manufacturer;

NOTE The registered address of the manufacturer may also be added.

b) The last two digits of the year in which the marking was affixed;

c) Reference to this European Standard and the year of its publication (i.e. EN 15821:2010);

d) Description of the sauna stove and its intended use:

   1) Generic name and/or model details;

e) Performance of those essential characteristics of the sauna stove listed in Table ZA.1, which are to be declared and, where relevant, expressed as “Pass” for the pass/fail requirements (where necessary), or “NPD“ (i.e. No performance determined) for those for characteristics, where this is relevant, namely for:

   1) Fire safety (e.g. initiation, risk to adjacent elements), dealt with by:

      i) Design, manufacture and assembly (see 4.2.1.1),

      ii) Cleaning of heating surfaces (see 4.2.2),

      iii) Flue spigot or sockets (see 4.2.3),

      iv) Ashpan and ash removal (see 4.2.4),

      v) Bottomgrate (see 4.2.5),

      vi) Combustion air supply (see 4.2.6),

      vii) (Control of) flue gasses (see 4.2.7),

      viii) Firedoor and charging doors (see 4.2.8),

      ix) Flue bypass device (see 4.2.9),

      x) Temperature rise of the operating components (see 5.1),

      xi) Temperature of adjacent combustible materials at manufacturer’s specified safety distances (see 5.2), and all expressed jointly as “Pass”;

   2) Flue gas temperature (see 6.1), tested acc. to A.4.6 and expressed as declared value (in °C);

3) Thermal output and energy efficiency, dealt with by:

   i) Carbon monoxide emission (see 6.2) expressed as “Pass” against a threshold value of < 1,0 % (at 13 % $O_2$) together with the measured mean value in % (at 13 % $O_2$) when tested according to A.4.6;

   ii) Total efficiency (see 6.3), expressed as “Pass” against a threshold value of ≥ 50 % together with the measured mean value (in %) when tested according to A.4.6;

   iii) Flue draught (see 6.4), tested acc. to A.4.6 and expressed as a declared value (in Pa);

   iv) Refuelling loads (see 6.5), tested according to A.4.6 and expressed as a declared value (in kg);

   v) Space heating output (see 6.6), tested according to A.4.6 and expressed as a declared nominal value (in kW);

4) Durability (see 4.2.1.2), expressed as “Pass”.

The “No performance determined” (NPD) option may not be used where the characteristic is subject to a threshold level. Otherwise, the NPD option may be used when and where the characteristic, for a given intended use, is not subject to regulatory requirements in the Member State of destination.

Figure ZA.1 gives an example of CE marking to be affixed on each multi-firing sauna stove fired by natural wood logs.




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| | | |
|---|---|---|
| CE | | *CE-marking symbol given in Directive 93/68/EEC* |
| AnyCo Ltd<br>**11** | | *Name or identifying mark of the manufacturer*<br>*NOTE Registered address of the manufacturer may also be added.*<br>*Last two digits of the year in which the marking was affixed* |
| **EN 15821:2010**<br>Multi-firing sauna stoves fired by natural wood logs for space heating in residential buildings<br>- Alpha Sauna Stove<br>- Model Beta 2 | | *Number of this European Standard and the year of its publication*<br>*Description of product and intended use* |
| **Fire safety** : (initiation, risk to adjacent elements) | Pass | *Performances of the regulated characteristics* |
| - including declared safety distance to combustible materials: | Back 400 mm<br>Side 400 mm<br>Ceiling 1 400 mm | |
| **Flue gas temperature** | 400 °C | |
| **Thermal output** and **Energy efficiency**, as: | | |
| - carbon monoxide emission at 13 % $O_2$ | Pass (0,3 %) | |
| - total efficiency | Pass (65 %) | |
| - flue draught | 12 Pa | |
| - thermal output (i.e. nominal space heating output) | 15 kW | |
| - refuelling loads | 10 kg | |
| **Durability** | Pass | |

**Figure ZA.1 — Example of CE marking to be affixed on each multi-firing sauna stove fired by natural wood logs**

### ZA.3.3 CE marking in the accompanying commercial documents

In addition to the information listed in ZA.3.2, a) to d), also the performance of the following characteristics shall accompany the CE-marking symbol given in the commercial documents, accompanying the multi-firing sauna stove (e.g. delivery note):

a) Performance of all essential characteristics of the sauna stove listed in Table ZA.1, which are to be declared and, where relevant, expressed as “Pass” for the pass/fail requirements (where necessary), or “NPD“ (i.e. No performance determined) for those for characteristics, where this is relevant, namely for:

   1) fire safety (e.g. initiation, risk to adjacent elements), dealt with by:

      i) design, manufacture and assembly (see 4.2.1.1);

      ii) cleaning of heating surfaces (see 4.2.2);

      iii) flue spigot or sockets (see 4.2.3);

      iv) ashpan and ash removal (see 4.2.4);

      v) bottomgrate (see 4.2.5);

vi) combustion air supply (see 4.2.6);

vii) (control of) flue gasses (see 4.2.7);

viii) firedoor and charging doors (see 4.2.8);

ix) flue bypass device (see 4.2.9);

x) temperature rise of the operating components (see 5.1);

xi) temperature of adjacent combustible materials at the manufacturer's specified safety distances (see 5.2), and all expressed jointly as "Pass";

2) emission of combustion products, dealt with by:

i) design, manufacture and assembly (see 4.2.1.1);

ii) bottomgrate (see 4.2.5);

iii) combustion air supply (see 4.2.6);

iv) control of flue gas (see 4.2.7);

v) flue bypass device (see 4.2.9), and all expressed jointly as "Pass";

3) surface temperature, dealt with by:

NOTE 1 Only for surfaces or parts of the sauna, which are not associated with the transmission of heat.

i) design, manufacture and assembly (see 4.2.1.1);

ii) temperature rise of the operating components (see 5.1);

iii) temperature of adjacent combustible materials (see 5.2), and all expressed jointly as "Pass";

4) release of dangerous substances (see Notes 1 and 2 in ZA.1);

5) cleanability, dealt with by:

i) design, manufacture and assembly (see 4.2.1.1);

ii) cleaning of heating surfaces (see 4.2.2);

iii) flue spigot or sockets (see 4.2.4);

iv) bottomgrate (see 4.2.5), and all expressed jointly as "Pass";

6) flue gas temperature (see 6.1), tested acc. to A.4.6 and expressed as declared value (in °C);

7) mechanical resistance (to carry a chimney/flue), dealt with by:

i) design, manufacture and assembly (see 4.2.1.1);

ii) flue spigot or sockets (see 4.2.3), and both expressed jointly as "Pass";

8) thermal output and energy efficiency, dealt with by:

i) carbon monoxide emission (see 6.2) expressed as "Pass" against a threshold value of < 1,0 % (at 13 % $O_2$) together with the measured mean value in % (at 13 % $O_2$) when tested according to A.4.6;

ii) total efficiency (see 6.3), expressed as “Pass” against a threshold value of ≥ 50 % together with the measured mean value in % when tested according to A.4.6;

iii) flue draught (see 6.4), tested acc. to A.4.6 and expressed as declared value (in Pa);

iv) refuelling loads (see 6.5), tested according to A.4.6 and expressed as declared value (in kg);

v) space heating output (see 6.6) tested according to A.4.6 and expressed as a declared nominal value (in kW);

9) durability (see 4.2.1.2), expressed as “Pass”.

The “No performance determined” (NPD) option may not be used where the characteristic is subject to a threshold level. Otherwise, the NPD option may be used when and where the characteristic, for a given intended use, is not subject to regulatory requirements in the Member State of destination.

Figure ZA.2 gives an example of CE marking to be given in the commercial documents, accompanying the multi-firing sauna stove fired by natural wood logs.




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| | |
|---|---|
| CE | *CE-marking symbol given in Directive 93/68/EEC* |
| AnyCo Ltd<br>**11** | *Name or identifying mark of the manufacturer*<br>*NOTE Registered address of the manufacturer may also be added.*<br>*Last two digits of the year in which the marking was affixed* |
| **EN 15821:2010**<br>Multi-firing sauna stoves fired by natural wood logs for space heating in residential buildings<br>- Alpha Sauna Stove<br>- Model Beta 2 | *Number of this European Standard and the year of its publication*<br>*Description of product and intended use* |

| | | |
|---|---|---|
| **Fire safety** (initiation, risk to adjacent elements) | | Pass |
| - including declared safety distance to combustible materials: | Back<br>Side<br>Ceiling | 400 mm<br>400 mm<br>1 400 mm |
| **Emission of combustible products** | | Pass |
| **Surface temperature** | | Pass |
| **Release of dangerous substances** | | NPD |
| **Cleanability** | | Pass |
| **Flue gas temperature** | | 400 °C |
| **Mechanical resistance** | | Pass |
| **Thermal output** and **Energy efficiency**, as: | | |
| - carbon monoxide emission at 13 % $O_2$ | | Pass (0,3 %) |
| - total efficiency | | Pass (65 %) |
| - flue draught | | 12 Pa |
| - thermal output (i.e. nominal space heating output) | | 15 kW |
| - refuelling loads | | 10 kg |
| **Durability** | | Pass |

*Performances of the regulated characteristics*

**Figure ZA.2 — Example of CE marking to be given in the commercial documents, accompanying the multi-firing sauna stove fired by natural wood logs**

In addition to any specific information relating to dangerous substances shown above, the product should also be accompanied, when and where required and in the appropriate form, by documentation listing any other legislation on dangerous substances for which compliance is claimed, together with any information required by that legislation.

NOTE 2 European legislation without national derogations need not be mentioned.

NOTE 3 Affixing the CE marking symbol means, if a product is subject to more than one directive, that it complies with all applicable directives.

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