BRITISH STANDARD

BS EN 13229:2001 +A2:2004

Incorporating corrigenda September 2003, June 2006 and August 2007

Inset appliances including open fires fired by solid fuels — Requirements and test methods

ICS 97.100.30

BSI British Standards

National foreword

This British Standard is the UK implementation of EN 13229:2001+A2:2004, incorporating corrigenda September 2003, June 2006 and August 2007. It supersedes BS EN 13229:2001+A1:2003 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by [A1⟩ ⟨A1].

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by CEN corrigendum August 2007 is indicated in the text by [AC1⟩ ⟨AC1].

Conflicting national standards will need either to be withdrawn or amended and these are under consideration in Technical Committee RHE/28. It is the intention of the committee to reach a decision by April 2008 on which course of action will be taken.

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.

Compliance with a British Standard cannot confer immunity from legal obligations.

Amendments/corrigenda issued since publication

Amd. No.	Date	Comments
14750	17 November 2003	See national foreword
15493	19 January 2005	See national foreword
16546 Corrigendum No. 1	31 October 2006	Replacement of formula (18) in A.6.2.7.1, Correction to A.6.2.1.1, A.6.2.9 and EN foreword, amendment A2
	30 April 2008	Implementation of CEN corrigendum August 2007

This British Standard was published under the authority of the Standards Policy and Strategy Committee and comes into effect on 5 September 2001

ISBN 978 0 580 60011 1

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13229:2001+A2

September 2004

ICS 97.100.30

Incorporating corrigenda September 2003, June 2006 and August 2007

English version

Inset appliances including open fires fired by solid fuels — Requirements and test methods

Foyers ouverts et inserts à combustibles solides — Exigences et méthodes d'essai

Kamineinsätze einschließlich offene Kamine für feste Brennstoffe — Anforderungen und Prüfung

This European Standard was approved by CEN on 7 April 2001.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 13229:2001 E

CONTENTS **page**

Foreword

This European Standard 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 December 2001, and conflicting national standards shall be withdrawn at the latest by December 2002.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Foreword to amendment A1

This document (EN 13229:2001/A1:2003) has been prepared by Technical Committee CEN/TC 295 "Residential solid fuel burning appliances", the secretariat of which is held by BSI.

This Amendment to the European Standard EN 13229:2001 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2003, and conflicting national standards shall be withdrawn at the latest by September 2003.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

Foreword to amendment A2

This document (EN 13229:2001/A2:2004) has been prepared by Technical Committee CEN/TC 295 “Residential solid fuel burning appliances”, the secretariat of which is held by BSI.

This Amendment to the European Standard EN 13229:2001 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2005, and conflicting national standards shall be withdrawn at the latest by July 2007.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directives.

For relationship with EU Directives, see informative Annex ZA, which is an integral part of this document.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This European Standard specifies requirements relating to the design, manufacture, construction, safety and performance (efficiency and emission), instructions and marking together with associated test methods for type testing, residential open fires and inset appliances fired by solid fuel.

This standard is applicable to hand fired appliances which are listed under categories 1b, 1c, 2b, 2c, 3a, 3b and 3c of Table 1. The surround of the appliances is integrated with the building with the exception of free-standing appliances and inset appliances which are installed into a fireplace recess or enclosure.

〈A1〉 This standard also covers 'Kachelöfen' and 'Putzöfen' inset appliances, having nominal heat outputs up to 15 kW in accordance with category lc of table 1. 〈A1〉

This standard is not applicable to appliances with fan assisted combustion air.

These appliances provide heat into the space where they are installed. Additionally, where fitted with a boiler, they also provide domestic hot water and/or central heating. They may burn either solid mineral fuels, peat briquettes, natural or manufactured wood logs or be multi-fuel in accordance with the appliance manufacturer's instructions.

Open fireplace components such as a bottomgrate with associated firefront which the manufacturer supplies for installation into an existing heat resistant, insulated firebox are not covered by this standard.

Table 1 - Categorisation of appliances

	a)	b)	c)
	Freestanding or inset appliances without functional modification	Freestanding or inset appliances which have functional modification	Inset appliances for fireplace recess and enclosure
1 appliances operating with firedoors closed	EN 13240	EN 13229	EN 13229
2 appliances operating with firedoors closed or open	EN 13240	EN 13229	EN 13229
3 open fires without firedoors	EN 13229	EN 13229	EN 13229
NOTE Without functional modification means a modification of the surround of an appliance, that only changes the transmission of heat, without effect on combustion.			

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication applies (including amendments).

〈A1〉 DIN 51060:1975 Refractory ceramic products and construction materials – Terms and definitions 〈A1〉

EN 1561:1997 Founding - Grey cast irons

EN 1563:1997 Founding - Spheroidal graphite cast irons

EN 10025:1993 Hot rolled products of non-alloy structural steels - Technical delivery conditions

EN 10027-2 :1992 Designation systems for steels - Part 2 : Numerical system

EN 10028-2:1992 Flat products made of steels for pressure purposes - Part 2: Non-alloy and alloy steels with specified elevated temperature properties

EN 10029:1991 Hot rolled steel plates 3 mm thick or above - Tolerances on dimensions, shape and mass

EN 10088-2:1995 Stainless steels - Part 2: Technical delivery conditions for sheet/plate and strip for general purposes

EN 10111:1998 Continuously hot-rolled low carbon steel sheet and strip for cold forming - Technical delivery conditions

EN 10120:1996 Steel sheet and strip for welded gas cylinders

〈A2〉 EN 50165 Electrical equipment of non-electric appliances for household and similar purposes – Safety requirements 〈A2〉

ISO 7-1: 1994 Pipe threads where pressure-tight joints are made on the threads - Part 1: Dimensions, tolerances and designation

ISO 7-2: 2000 Pipe threads where pressure-tight joints are made on the threads - Part 2: Verification by means of limit gauges

ISO 228-1: 2000 Pipe threads where pressure-tight joints are not made on the threads - Part 1: Dimension, tolerances and designation

ISO 228-2: 1987 Pipe threads where pressure-tight joints are not made on the threads - Part 2: Verification by means of limit gauges

ISO 331:1983	Coal - Determination of moisture in the analysis sample - Direct gravimetric method
ISO 334:1992	Solid mineral fuels - Determination of total sulfur - Eschka method
ISO 351:1996	Solid mineral fuels - Determination of total sulfur - High temperature combustion method
ISO 501:1981	Coal - Determination of the crucible swelling number
ISO 562:1998	Hard coal and coke - Determination of volatile matter
ISO 609:1996	Solid mineral fuels - Determination of carbon and hydrogen - High temperature combustion method
ISO 687:1974	Coke - Determination of moisture in the analysis sample
ISO 1171:1997	Solid mineral fuels - Determination of ash content
ISO 1928:1995	Solid mineral fuels - Determination of gross calorific value by the bomb calorimetric method, and calculation of net calorific value
A2 ISO 2859 (all parts) A2	Sampling procedures for inspection by attributes

3 Terms and definitions

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

3.1 Appliances

3.1.1
appliance with boiler
heat generator consisting of a room heating component and a water heating component in one unit

3.1.2
continuous burning appliance
heating appliance designed to provide a source of heat by continuous burning and meeting the requirement of the slow combustion test

3.1.3
fireplace recess
space formed in a wall or chimney breast constructed from non combustible materials and into which a heating appliance may be installed and from which a chimney flue leads

3.1.4
fireplace enclosure
assembly consisting of walls and ceiling of non-combustible materials which is built on site to surround a heat generator and heat exchanger and to form a space from which hot convection air is emitted into the living space e.g. by means of air grilles

3.1.5
freestanding appliance
appliance designed to operate without the need to be built into a fireplace recess or fireplace enclosure and which is not connected to the building except by the flue gas connector

3.1.6
inset appliance
appliance with or without firedoors designed to be installed into a fireplace recess or an enclosure, or into a firebox of an open fire

3.1.7
intermittent burning appliance
heating appliance designed to provide a source of heat by intermittent burning and meeting the requirement of the reduced combustion test

NOTE An appliance may be either a continuous burning appliance or an intermittent burning appliance according to the fuel used.

3.1.8
open fire
appliance which is built as an inset and designed to be connected to the building and surrounded by non combustible materials

3.1.9
roomheater
appliance having a fully enclosed firebox with firedoor which is normally closed, that distributes heat by radiation and/or convection and also provides hot water when fitted with a boiler

〚A1〛 3.1.10
“Kachelöfen” or “Putzöfen” inset
appliance consisting of a heat generator connected to a heat-exchanger forming the flueway and surrounded by an enclosure. The ‘Kachelöfen’ and ‘Putzöfen’ inset appliance may be fitted with a thermostat to automatically control the room temperature 〈A1〛

3.2 Functional characteristics

3.2.1
ash content of the fuel
solid matter remaining after the complete combustion of solid fuel

3.2.2
basic firebed
quantity of glowing embers which ensures ignition of the test fuel to be charged

NOTE The basic firebed may be specified by the manufacturer.

3.2.3
burning rate
reduction in the mass of fuel per unit of time

3.2.4
combustion air
air supplied to the firebox, which is entirely or partially used to burn the fuel

3.2.5
combustion gases
compounds in gaseous form produced inside the appliance when the fuel is burned

3.2.6
efficiency
ratio of total heat output to total heat input expressed as a percentage during the test period

3.2.7
flue draught
differential between the static air pressure in the place of installation and the static pressure at the flue gas measurement point

3.2.8
flue gases
gaseous compounds leaving the appliance flue spigot and entering the flue gas connector

3.2.9
flue gas mass flow
mass of flue gas drawn off from the appliance per unit of time

3.2.10
flue gas temperature
temperature of the flue gas at the specified point in the measurement section

3.2.11
heat input
quantity of energy which the fuel provides to the appliance

3.2.12
maximum water operating pressure
limiting water pressure at which the boiler of an appliance can be safely operated

[A1] 3.2.13
nominal heat output
total heat output of the appliance without accumulation quoted by the manufacturer and achieved under defined test conditions when burning the specified test fuel [A1]

3.2.14
operating tool
device supplied with the appliance for handling movable and/or hot components

3.2.15
recovery capability
ability of the appliance to re-ignite existing or newly charged fuel after a defined burning period without external assistance

3.2.16
reduced combustion capability
ability of an intermittent burning appliance to continue burning for a minimum period, dependent on appliance type and fuel burned, without any input of fuel and without any external interference with the combustion process, in such a manner that at the end of the test the basic firebed can be recovered

3.2.17
refuelling interval
period of time for which the combustion may be maintained in the appliance with a single load of fuel, without intervention by the user

3.2.18
residue
ashes, including combustibles, which collect in the ashpit

3.2.19
routine test pressure
pressure to which all waterways are subjected during production at the manufacturer's plant or during setting up by the installer

3.2.20
slow combustion capability
ability of a continuous burning appliance to continue burning for a minimum period dependent on appliance type and fuel burned, without any input of fuel and without any external interference with the combustion process, in such a manner that the basic firebed can be recovered at the end of this period

3.2.21
slow combustion heat output
heat output achieved under slow combustion conditions during the test period

3.2.22
space heating output
heat output furnished by convection and radiation to the room

3.2.23
steady-state condition
stage in which values to be measured in successive equal periods of time do not exhibit significant change

3.2.24
temperature in the fuel storage container
temperature at the hottest point, measured in the area of possible fuel storage

3.2.25
total heat output
rate of useful heat released by the appliance

3.2.26
type test pressure
pressure to which all waterways of the test appliance are subjected

3.2.27
water flow temperature
temperature of the heated water exiting the appliance

3.2.28
water heating output
heat output to water, averaged during the test period

3.2.29
water return temperature
temperature of the cooled water entering the return tapping connectors of the appliance

3.2.30
heat output
quantity of useful heat released by the appliance

3.2.31
accumulation heat output
quantity of useful heat released by an appliance with accumulator (i.e. the heat output from both the appliance and the accumulator) when burning the test fuel load stated by the manufacturer and achieved under defined test conditions in accordance with this standard (see A.4.10)

3.3 Characteristics

3.3.1
air inlet control
manual or automatic device to control the quantity of air supplied for combustion

3.3.2
air grilles
components in the inlet and outlet openings to distribute and direct convection air flow

3.3.3
ashpan
removable receptacle shaped to receive the residues falling from the firebed

3.3.4
ashpit
enclosed chamber designed to receive the residues or the ashpan

3.3.5
boiler
vessel in which water is heated, intended for fitting in or forming an integral part of a solid fuel appliance

3.3.6
boiler flueway
portion of the flueway formed wholly or in part by the surfaces of the boiler

3.3.7
bottomgrate
part of the appliance at the base of the firebox which supports the firebed and through which the ash fall into the ashpan and combustion air and/or combustion gases may pass

3.3.8
charging door
door which covers the refuelling opening

3.3.9
combustion air selector
device for adjusting the primary and/or secondary air according to the type of fuel burnt

3.3.10
combustion area
surface covered with fuel which may have openings for the passage of the combustion air or combustion gases

3.3.11
combustion control device
mechanism for setting the primary and/or secondary air in accordance with the burning rate required

3.3.12
combustion gas baffle
device to change the direction of flow of the combustion gases

3.3.13
cut-off device
mechanism to block the flue when the appliance is not in use

3.3.14
damper
mechanism to change the resistance to flow of the combustion gases

3.3.15
de-ashing mechanism
mechanism to agitate or disturb the residues to facilitate their removal from the firebed

NOTE May also be used to change the bottomgrate operating positions on some appliances.

3.3.16
direct water system
hot water system in which stored domestic hot water is heated directly by hot water circulating from the boiler

3.3.17
draught regulator
inlet device for admission air downstream of the firebed, enabling the flue draught to be controlled

3.3.18
firebox; combustion chamber
that part of the appliance in which the fuel is burned

3.3.19
firebox opening
aperture in the firebox through which the appliance may be fuelled

3.3.20
firedoor
door through which the fire may be viewed and which may be opened to allow refuelling of the firebed

3.3.21
flue gas adaptor
fitting between the flue spigot of an appliance and the inlet to the flue gas connector or chimney flue which allows for variations in size and shape of components

3.3.22
flue by-pass device
device which in the open position allows flue gases to pass directly to the flue spigot

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

3.3.23
flue gas connector
▌A2⟩ duct through which flue gases are conveyed from the flue spigot of the appliance into the chimney flue ⟨A2▐

3.3.24
flue spigot/flue socket
integral part of the appliance for connecting the flue gas connector, thus permitting the deliberate escape of products of combustion into the chimney flue

3.3.25
flueway
the part of the appliance designed to convey combustion gases from the firebox to the flue spigot

3.3.26
front firebars/deepening plate
grating or plate fitted at the front of a firebox opening to prevent spillage of fuel and ash or to change the firebox capacity, or both

3.3.27
fuel hopper
fuel store integral with the appliance from which fuel is fed to the firebox

3.3.28
indirect water system
hot water system in which stored domestic hot water is heated by a primary heater through which hot water from the boiler is circulated without mixing of primary (heating) water and the stored domestic hot water

3.3.29
integral fuel storage container
enclosed area forming part of the appliance, 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

3.3.30
primary air
combustion air which passes through the fuel bed

3.3.31
safety heat exchanger
device which allows excess heat to be released from an appliance

3.3.32
secondary air
air supplied for the purpose of completing combustion of gases leaving the fuel bed

3.3.33
thermal discharge control
mechanical device controlled by the water flow temperature which opens a drain in the water circuit of a safety heat exchanger when a specified flow temperature is attained

3.3.34
thermostat
temperature sensitive device which automatically changes the combustion air inlet cross sectional area

3.3.35
working surfaces
all surfaces of an appliance designed to transmit heat to the surrounding atmosphere

NOTE All external surfaces of an appliance including the flue gas connector in accordance with this standard are classified as working surfaces because they are designed to transmit heat to the room in which they are installed.

〈A1〉 3.3.36
accumulator
that part of the appliance forming the flueway consisting of ceramic materials and designed for accumulation of the heat released by the heat generator

3.3.37
accumulator load
quantity of heat which the fuel provides to the appliance for accumulation 〈A1〉

3.3.38
firedoor window
window through which the fire can be observed

3.3.39
heat exchanger
device connected to the heat generator by a flue gas pipe which extends the heat surface and may be used as an accumulator

3.3.40
heat generator
component of an inset in which the fuel is burned

3.3.41
heat generator flue spigot
part of the heat generator for connecting the flue gas pipe (see Figure A.13)

3.3.42
automatically operated inset
inset equipped with a temperature thermostat to adjust output and room temperature and, if applicable, with control devices operated by auxiliary energy

3.3.43
room temperature thermostat
device designed to keep nearly steady the manually set room temperature

3.4 Fuels

3.4.1
recommended fuels
fuel of commercial quality, listed in the appliance manufacturer's instructions, and shown to achieve the claimed performance when tested according to this European Standard

3.4.2
solid fuel
naturally occurring or manufactured solid mineral fuels, natural or manufactured wood logs and peat briquettes

3.4.3
solid mineral fuels
coal, lignite, coke and fuels derived from these

3.4.4
test fuel
fuel of commercial quality being characteristic of its type to be used for testing appliances

4 Materials, design and construction

4.1 Production documentation

The manufacturer shall state the type of appliance which he submits for type testing and the test laboratory shall test the appliance using the provisions appropriate to that claim.

A2 The parameters and characteristics considered in making the decisions in relation to either the family or range of appliances to be submitted for initial type testing (see 9.2.1) or further type testing where changes are made to an appliance (see 9.2.2) shall be recorded. A copy of the parameters and characteristics considered in making the decisions shall be included in the production documentation for each appliance. A2

To identify the appliance, the manufacturer shall have available documents and/or scaled assembly drawings showing the basic design and construction of the appliance. The documentation and/or the drawings shall include at least the following information:

- the specification of the materials used in the construction of the appliance,
- the nominal heat output in kW using fuels recommended by the manufacturer.

If the appliance is fitted with a boiler then the following additional details shall also be specified:

- the welding process used in the manufacture of the boiler shell;

NOTE The symbol for the type of weld used is sufficient.

- the permissible maximum operating water temperature in °C;
- the permissible maximum operating pressure in bar;
- the type test pressure in bar;
- the water heating output in kW.

4.2 General construction requirements

The shape and dimensions of the components and equipment and the method of design and manufacture and, if assembled on site, the method of assembly and installation shall ensure that, when operated in accordance with the provisions of the appropriate test and exposed to the associated mechanical, chemical and thermal stresses, the appliance shall operate reliably and safely such that during normal operation no combustion gases posing a hazard can escape into the room in which the appliance is installed nor can embers fall out.

Component parts such as covers, operating controls, safety devices and electrical accessories shall be arranged in such a way that their surface temperatures, under the test conditions described in A.4.7, do not exceed those specified either by the manufacturer or in the relevant component part standard.

No part of the appliance shall comprise of or contain asbestos. Hard solder, containing cadmium in its formulation, shall not be used.

Where thermal insulation is used, it shall be made of non-combustible material and shall not be a known hazard to health in its applied position.

NOTE The thermal insulation should withstand normal thermal and mechanical stresses.

Component parts which require periodic replacement and/or removal shall be either so designed or identified so as to ensure correct fitting.

Parts which act as a seal shall be located securely; for example by means of bolts or welding; to prevent the ingress or leakage of air, water or combustion products.

Where a seal is made with fire cement, the cement shall be supported by adjacent metal surfaces.

If the appliance is fitted with a boiler it shall meet the requirements given in 4.13 as appropriate to the material of construction and intended usage.

The boiler, if fitted, shall be capable of operating safely at the permissible maximum operating pressure declared by the manufacturer and shall meet the requirements of the type pressure test described in 5.8.

4.3 Flue spigot or socket

The flue spigot or socket where required for installation purposes shall be designed to enable a suitable gastight connection to be made between the flue gas connector and the appliance. The spigot or socket shall provide a good fit for the size of pipe recommended by the manufacturer. Where the flue gas connector fits over an outlet spigot the overlap shall be a length of at least 25 mm for a pipe diameter of 160 mm or less, and at least 40 mm for a pipe diameter greater than 160 mm. Where the flue 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.

4.4 Combustion control device

The device shall be easily accessible and shall be permanently marked.

NOTE It is important that the effect of adjusting its controlling positions can be perceived by the user.

4.5 Flueways

A1 4.5.1 Kachelöfen or Putzöfen inset appliances

Flueways shall be tight and shall have tight cleaning openings, which allow a proper cleaning. Metal flueways shall be made of steel as given in Table 2 with a minimum thickness of 2 mm or cast iron as given in Table 5 with a thickness of 4 mm or of austenitic stainless steel with a thickness of 1 mm. Fireclay bricks, plates or components of flueways shall comply with DIN 51060. A1

〈A1〉 4.5.2 All other appliance types

It shall be possible to clean the flueways of the appliance completely using commercially available tools or brushes, unless special cleaning tools or brushes are provided by the manufacturer. The size of the flueway in its minimum dimension shall be not less than 30 mm except that where fuels other than bituminous coal are burned it shall be permissible to reduce it to not less than 15 mm provided an access door(s) is provided for cleaning the flueway. 〈A1〉

4.6 Cleaning tools

The appliance manufacturer shall make available purpose designed brushes and scrapers where ordinary household brushes cannot be used effectively for cleaning internal flueways.

4.7 Firedoors and charging doors

Where the appliance is fitted with a firedoor or charging door they shall be large enough so that the appliance can be filled with the commercial fuels recommended by the manufacturer. When open any firedoors shall not obstruct the firebox opening. The door shall be designed to prevent accidental opening and to facilitate positive closure.

4.8 Combustion air supply

4.8.1 Primary air inlet control

The appliance 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 or permanently marked so that its operation is readily understandable. Where an appliance is designed for multifuel use a means shall be provided for the user to identify the correct set position of the primary air inlet control for each fuel type. Means of identification of the thermostat shall also be provided by the appliance manufacturer.

NOTE The design should be such that during operation of the appliance, neither ash nor unburnt fuel can prevent the movement or the closure of the air inlet control.

4.8.2 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 this air is not restricted when the firebox is filled to the manufacturer's recommended capacity.

NOTE A secondary air inlet control is recommended for admission of air to minimise the risk of condensation and the accumulation of combustion gases.

4.9 Internal flue gas diverter

Any internal flue gas diverter shall be capable of maintaining any position in which it is intended to be set and shall not isolate the firebox from the flue outlet. If a diverter is intended to be removable then it shall either be permanently and legibly marked or so designed and/or identified as to ensure correct assembly.

Any diverter control shall be permanently and legibly marked to identify its set position to the user.

4.10 Bottomgrate

Where the bottomgrate is removable it shall be designed or marked to ensure correct assembly. If a de-ashing mechanism is fitted it shall be capable of de-ashing the fuel bed in the area of the bottomgrate.

NOTE The preferred design should allow de-ashing to be carried out with the ashpit door closed. The de-ashing operation should be possible without undue effort. If it is necessary to remove the ashpit door to de-ash the fire, the appliance should be designed such that there is no undue spillage of ash or fuel from the appliance during the de-ashing operation.

⟨A1⟩ Grate devices fitted to Kachelöfen or Putzöfen inset appliances shall be easy to de-ash without undue effort. ⟨A1⟩

4.11 Front firebars and/or deepening plate

If the appliance is fitted with removable front firebars/deepening plates, they shall be designed such that they can be neither incorrectly fitted nor accidentally dislodged.

NOTE The front firebars/deepening plate should be designed to retain the fuel or ash during operation particularly during refuelling or de-ashing of the appliance.

4.12 Ashpan and ash removal

A means of removing the residue from the appliance shall be provided. Where an ashpan is provided, it shall be capable of containing the residue from two full charges of fuel whilst retaining sufficient space above to allow adequate primary air flow through the bottom grate or fire bed. If the ashpan resides in the appliance 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 does not abstruct any primary inlet control.

⟨A1⟩ Kachelöfen or Putzöfen inset appliances designed to burn coal as well as wood shall be equipped with an ashpan having a minimum volume capacity of 0,8 dm^3 per kW of nominal heat output. For Kachelöfen' or 'Putzöfen' insets which are specifically designed to burn wood logs and wood briquettes, and if they are equipped with an ashpan, the minimum volume capacity of this ashpan shall be 0,5 dm^3 per kW of nominal heat output. ⟨A1⟩

NOTE 1 An ashpan should be designed and constructed to ensure that:

a) it effectively collects the residue material 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 2 The ashpan can be shovel shaped.

4.13 Integral boiler

4.13.1 General construction

The boiler shall be constructed from steel or cast iron and shall be capable of operating at the maximum water operating pressure stated by the manufacturer. This requirement shall be verified by the type pressure test in accordance with A.4.9.5.

The materials and dimensions for the boiler construction shall be in accordance with the specifications given in Tables 2 to 7.

One or more of the steel materials complying at least with the specifications given in Table 2 shall be used for the manufacture of those parts of the appliance subject to water pressure.

Table 2 - Steel material types

References	Material Type	Material number in accordance with EN 10027-2:1992
EN 10111:1998	DD 11	1.0332
	DD 12	1.0398
	DD 13	1.0335
	DD 14	1.0389
EN 10025 :1993	S235JR	1.0037
	S235JRG2	1.0038
	S235JO	1.0114
	S235J2G3	1.0116
	S275JR	1.0044
	S275JO	1.0143
	S275J2G3	1.0144
	S355JR	1.0045
	S355JO	1.0553
	S355J2G3	1.0570
	S355K2G3	1.0595
EN 10028-2:1992	P235GH	1.0345
	P265GH	1.0425
	P295GH	1.0481
	P355GH	1.0473
	16Mo3	1.5415
	13CrMo4-5	1.7335
	10CrMo9-10	1.7380
	10CrMo9-10	1.7383
EN 10120:1996	P245NB	1.0111
	P265NB	1.0423
	P310NB	1.0437
	P355NB	1.0557
EN 10088-2:1995	X5CrNi 18-10	1.4301
	X6CrNi 17-12-2	1.4401
	X6CrNiTi 18-10	1.4541
	X6CrNiNb 18-10	1.4550
	X6CrNiMo Ti 17-12-2	1.4571
	X6CrNiMoNb 17-12-2	1.4580
	X3CrNiMo 17-3-3	1.4436
NOTE Materials and wall thicknesses other than those specified may only be used on production of appropriate evidence as regards at least their equivalent corrosion resistance, heat resistance and strength to non-alloy steel at the material thicknesses specified in 4.13.2 for the particular application/usage.		

4.13.2 Nominal minimum wall thickness (steels)

The nominal minimum wall thickness of steel sheets and tubes subject to water pressure shall be in accordance with Table 3.

The tolerances on the nominal minimum wall thicknesses for carbon steels given in Table 3 shall be as specified in EN 10029:1991.

Table 3 - Steel – Nominal minimum wall thicknesses

Application	Non-alloy steels mm	Stainless and corrosion protected steels mm	Non-alloy steels for appliances burning wood only and having maximum water operating pressures up to and including 2 bar mm
Walls of water backed surfaces of the combustion chamber in contact with burning fuel or products of combustion	5	2	3,5
Walls of convection heating surfaces outside combustion chamber (except circular tubes)	4	2	3
Circular tubes used in convection part of heat exchanger	3,2	1,5	3,2
Water cooled grate tubes	4	3	3
Surfaces other than those above	3	2	3

NOTE 1 The nominal minimum wall thicknesses apply to pressure loaded sheets and tubes, being part of the boiler construction.
NOTE 2 The nominal minimum wall thicknesses listed have been specified taking into consideration the following parameters:
- the permissible maximum water operating pressure (as stated by the manufacturer);
- the material properties;
- the heat transfer location.

4.13.3 Welding and welding materials

The materials used shall be suitable for welding. The materials listed in Table 2 are suitable and do not require any additional heat treatment after welding.

4.13.4 Minimum wall thicknesses (cast iron)

The wall thicknesses given in the production drawing shall not be less than the minimum thickness listed in Table 4.

Table 4 - Cast Iron - Minimum wall thicknesses

Nominal heat output kW	**Grey cast iron**	**Spheroidal Graphite cast iron**
	Minimum wall thickness mm	
< 30	3,5	3,0
≥ 30 < 50	4,0	3,5

4.13.5 Cast iron parts subject to water pressure

The minimum mechanical properties of cast irons used for parts subject to water pressure shall meet the requirements given in Table 5.

Table 5 - Minimum mechanical requirements for cast iron

Grey cast iron (In accordance with EN 1561:1997*)*	
- Tensile strength R_m	> 150 N/mm^2
- Brinell hardness	160 HB to 220 HB
Spheroidal graphite cast iron (In accordance with EN 1563:1997)	
- Tensile strength R_m	> 400 N/mm^2
- Elongation	18 % A_3

4.13.6 Venting of the water sections

The water sections of the boiler shall be vented. The boiler shall be so designed that under normal operation in accordance with the manufacturer's instructions, no undue boiling occurs.

4.13.7 Water tightness

Holes, for screws and components which are used for the attachment or removal of parts shall not open into waterways or spaces through which water flows.

NOTE This does not apply to pockets for measuring, control and safety equipment.

4.13.8 Water side connections

The thread size of the flow and return tappings shall be not less than the minimum thread size designation given in Table 6.

Where tapered threads are used, they shall be in accordance with the requirements of ISO 7-1:1994 and ISO 7-2:2000. Where parallel threads are used, they shall be in accordance with ISO 228-1:2000 and ISO 228-2:1987. The design and position of flow tappings shall be such that air will not be retained within the boiler shell.

Table 6 - Minimum thread size designation of flow and return tappings

Nominal heat output kW	Gravity circulation thread size designation [1)]	Pumped circulation thread size designation [1)]
≤ 22	1	½
> 22 ≤ 35	1¼	1
> 35 < 50	1½	1
[1)] Designation in accordance with ISO 7-1:1994 and ISO 7-2:2000 or ISO 228-1:2000 and ISO 228-2:1987.		

If boilers are supplied with reducing bushes in horizontal flow tappings, these shall be eccentric and fixed so that the reduced outlet is uppermost. The minimum depth of tapping or length of thread shall conform to Table 7.

Table 7 - Minimum depth of tapping or length of thread

Thread size designation [1)]	Minimum depth or length of thread mm
½ to 1¼	16
1½	19
[1)] Designation in accordance with ISO 7-1:1994 and ISO 7-2:2000 or ISO 228-1:2000 and ISO 228-2:1987	

Where a drain socket is provided in the boiler shell, it shall be a minimum thread size designation of ½ and shall be in accordance with ISO 7-1:1994 and ISO 7-2:2000 or ISO 228-1:2000 and ISO 228-2:1987.

4.13.9 Boiler internal waterways

4.13.9.1 Design of all boiler waterways

The design of the boiler shall ensure a free flow of water through all parts. To minimise the build up of sediment, designed sharp or wedge shaped waterways with a taper towards the bottom shall be avoided. Where inspection holes are provided in the boiler to give access for inspection and cleaning of the waterways, they shall be of minimum size 70 mm x 40 mm or have a minimum diameter of 70 mm and be sealed with a gasket and cap.

4.13.9.2 Boiler waterways used with indirect water systems

The minimum internal dimension of waterways throughout the main body of the appliance shall be not less than 20 mm, except where waterways have to be reduced locally to facilitate manufacture or are in areas not in direct contact with burning fuel: in these cases the width of the waterways shall not be less than 15 mm.

4.13.9.3 Boiler waterways used with direct water systems

The minimum internal dimension of waterways in boilers designed for direct water systems shall not be less than 25 mm.

4.14 Control of flue gas

If a flue damper is fitted, it shall be a type which does not block the flue totally by accumulation of combustion residue. 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 recognisable to the user 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.

4.15 Cleaning of heating surfaces

All heating surfaces shall be accessible from the flue gas side for inspection and cleaning. Where cleaning and servicing of the boiler and its components require special tools (eg. special brushes) these shall be supplied by the manufacturer.

5 Safety

5.1 Cut-off device for appliances without doors

If a cut-off device is fitted to an appliance without doors, it shall separate the appliance from the chimney. The cut-off device shall not hinder control or cleaning of the connecting parts, and the device shall maintain the position in which it is set.

The marking of the position of the operating handle shall enable identification of the position of the cut-off device. The cut-off device shall only be installed into the flue gas collector, flue spigot or flue gas connector and it shall separate the flueway from the chimney. The cut-off device shall only be used when the appliance is out to prevent heat loss from the room via the chimney and to prevent the fall of soot into the room when the chimney is swept.

5.2 Temperatures of adjacent combustible materials

[A2] The appliance manufacturer shall provide in his installation instructions the necessary information for either insulating the walls and/or the floor and/or the ceiling or indicating the required clearance distances to ensure that the temperature of any adjacent walls, floor or ceiling or other structure constructed of combustible materials do not exceed the ambient temperature by more than 65 K.

When tested during the performance test at nominal heat output in accordance with A.4.7, and the temperature safety test in accordance with A.4.9, and when the appliance is installed in accordance with the clearance distances specified in the manufacturer's installation instructions, the temperature of the test hearth and walls and/or ceiling or any other structure surrounding the appliance comprising combustible material shall not exceed the ambient temperature by more than 65 K. [A2]

5.3 Operating tools

An operating tool shall be provided where it would otherwise be necessary to touch any surface having a temperature above ambient by more than the following values:

- 35 K for metal;
- 45 K for porcelain, vitreous enamel or similar materials;
- 60 K for plastics, rubber or wood.

These temperature requirements shall be assessed during the nominal heat output test in accordance with A.4.7.

NOTE A suitable glove is regarded as a tool.

5.4 Natural draught safety test

If the appliance manufacturer claims that the appliance is capable of continuous operation and/or claims that the duration of slow combustion for wood is greater than or equal to 8 hours and it is specified that the appliance may be installed into a shared flue i.e. a chimney serving more than one appliance it shall be tested in accordance with A.4.9.4. [A2] When tested in accordance with A.4.9.4 either the flue draught throughout the test period shall be not less than 3 Pa or where the flue draught falls below 3 Pa then over a further 10 h period from when the draught falls below 3 Pa the total quantity of carbon monoxide in the flue gas, calculated to NTP as detailed in A.6.2.8, shall not be greater than 250 dm^3. [A2]

5.5 Safety test for spillage of combustion gas and discharge of embers

When operated under the test conditions described in A.4.7 to A.4.9 there shall not be any potentially harmful spillage of flue gases from the appliance into the room and embers shall not fall out.

5.6 Temperature in integral fuel storage container (other than the fuel hopper)

When tested during the temperature safety test in accordance with A.4.9.2 the temperature in any integral fuel storage container shall not exceed the ambient temperature by more than 65 K.

5.7 Thermal discharge control

For appliances fitted with a boiler designed to operate on a sealed system and where a thermal discharge control is fitted as part of the appliance, when tested in accordance with A.4.9.6, the control shall operate when the water flow temperature exceeds either 105 °C or the manufacturer's declared operating temperature whichever is the lower.

5.8 Strength and leaktightness of boiler shells

The boiler shell and its water carrying components shall not leak or become permanently deformed when subjected to the type pressure test described in A.4.9.5 or during the nominal heat output test described in A.4.7.

A1 5.9 Size of the firedoor window for Kachelöfen or Putzöfen inset appliances

The area of the firedoor window for Kachelöfen or Putzöfen inset appliances shall not be greater than 600 cm^2. Interrupted firedoor windows shall be considered as being connected. Where there are several firedoor windows, the different areas shall be added together.

5.10 Temperature at air grilles for Kachelöfen or Putzöfen inset appliances

For the test in compliance with A.4.7 and A.4.10 the temperature recorded at the central flow at a distance of 15 cm from outside of the air grilles shall not be greater than 85 ºC when referenced to an ambient temperature of 25 ºC. A1

A2 5.11 Electrical safety

The appliance shall comply with the electrical safety requirements of EN 50165 if mains operated electrical equipment is fitted as part of the appliance. A2

6 Performance

6.1 Flue Draught

6.1.1 Appliances with closed firebox

The flue draught values related to the appliance’s nominal heat output given in Figure 1 shall be taken as the mean value for the static pressure to be applied in the measurement section during testing.

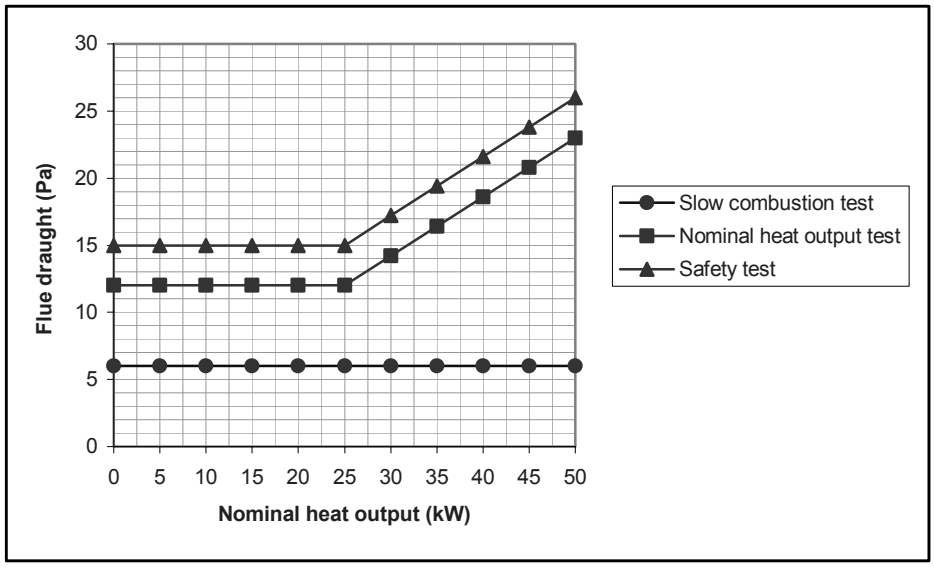


Figure 1 - Flue draught values

Appliances with a nominal heat output less than or equal to 25 kW shall be tested at a flue draught of (12 ± 2) Pa during the nominal output test and at (15 $^{+2}_{0}$) Pa during the temperature safety test.

Appliances having a nominal heat output greater than 25 kW shall be tested during the nominal heat output test either at a flue draught related to the nominal heat output of the appliance as given in Figure 1 or at such flue draught given by the manufacturer in the appliance instructions. For the temperature safety test these appliances shall be tested at a flue draught 3 Pa greater than that used during the nominal heat output test and shall be kept within $^{+2}_{0}$ Pa of this value.

The slow combustion test shall be carried out with a flue draught of (6 ± 1) Pa.

6.1.2 Appliances with open firebox

When measuring nominal heat output, water heating output and space heating output in accordance with A.4.7 the mean flue draught shall be (10 ± 2) Pa. When testing for safety in accordance with A.4.9.3 the flue draught shall be (14 $^{+2}_{0}$) Pa.

▌A1⟩ 6.1.3 Kachelöfen or Putzöfen inset appliances

The following flue draughts shall be met during the appropriate test:

For the test at nominal heat output, the test of heat output for accumulation, the safety-test with fir timber and the recovery test the flue draught shall be (15 ± 2) Pa.

For the slow combustion test the flue draught shall be (7 ± 2) Pa. ⟨A1▌

6.2 Flue gas temperature

During the performance test at nominal heat output in accordance with A.4.7 the mean flue gas temperature in the test measurement section shall be measured and recorded.

[A1] 6.3 Carbon monoxide emission for appliances with closed doors

6.3 1 Carbon monoxide emission for Kachelöfen or Putzöfen inset appliances

When tested in accordance with A.4.7 and A.4.10 the mean carbon monoxide content of the dry flue gas shall not exceed 0,2 % related to 13 % O_2 when the test fuels corresponding to Table B.1 are burned. [A1]

[A2] 6.3.2 Carbon monoxide emission for all other appliances with closed doors

When measured at nominal heat output in accordance with A.4.7, the mean carbon monoxide concentration calculated to 13 % oxygen (O_2) content in the flue gas shall be less than or equal to the manufacturer's declared value and shall not exceed 1,0 %.

Some countries have existing national legislation which set limits for maximum carbon monoxide concentration levels under nominal heat output and/or slow or reduced combustion, in these cases the carbon monoxide level shall be measured during the nominal heat output test in accordance with A.4.7 and the slow or reduced combustion test in accordance with A.4.8 for appliances sold in that country.

[AC1] NOTE In some countries national laws also require limits for particulate and organic compound emissions, emissions under slow combustion conditions and for weighed values for emissions to be used. In some countries clean air legislation is based on the use of authorized fuels. [AC1]

6.4 Efficient energy utilization

6.4.1 General

When the appliance is operated as specified by the manufacturer, burning the specified fuels representing the recommended fuels listed in the operating instructions, it shall meet the requirements of 6.4.2 or 6.4.3 as appropriate to the appliance type.

6.4.2 Efficiency of Kachelöfen or Putzöfen inset appliances

When tested in accordance with A.4.7, the measured total efficiency from the mean of at least two test results at nominal heat output shall be greater than or equal to the manufacturer's declared value and shall be not less than 75 %.

6.4.3 Efficiency for all other appliance types

When tested in accordance with A.4.7, the measured total efficiency from the mean of at least two test results at nominal heat output shall be greater than or equal to the manufacturer's declared value and shall equal or exceed 30 %.

Some countries have existing national legislation which set limits for minimum efficiency under nominal heat output and/or slow or reduced combustion, in these cases the minimum efficiency shall be determined during the nominal heat output test in accordance with A.4.7 and the slow or reduced combustion test in accordance with A.4.8 for appliances sold in that country. [A2]

6.5 Refuelling intervals at nominal heat output

When tested in accordance with A.4.7, the refuelling interval at nominal heat output on one charge of test fuel shall be not less than the values given in Table 10 as appropriate to the appliance type and/or test fuel used.

[A1]

Table 10 - Minimum refuelling intervals at nominal heat output

Appliance type	Test fuel type (as detailed in Table B1)	Minimum refuelling intervals	
		Firedoors open	Firedoors closed
Continuous burning appliance	Wood logs or peat briquettes	no requirements	1 h
	All other test fuels	1,5 h	4 h
Intermittent burning appliance	Wood logs or peat briquettes	no requirements	0,75 h
	All other test fuels	no requirements	1 h
Kachelöfen or Putzöfen inset appliance	Wood logs or peat briquettes	Not applicable	$90\ ^{+10}_{-20}$ min
	All other test fuels	Not applicable	≥ 4 h

[/A1]

[A2] The nominal load shall be calculated using the refuelling intervals, the manufacturer's declared efficiencies and the calorific values of the fuels as detailed in A.4.2. [/A2]

Where the refuelling interval declared by the manufacturer is greater than the minimum refuelling interval given in Table 10 then the manufacturer's declared value shall be verified when tested during the nominal heat output test in accordance with A.4.7.

6.6 Nominal heat output

〈A1〉 6.6.1 Nominal heat output for Kachelöfen or Putzöfen inset appliances

The value of nominal heat output declared by the manufacturer shall not be greater than the measured heat output value obtained during the test in accordance with A.4.7. This value shall be rounded to a multiple of 0,5 kW.

6.6.2 Nominal heat output for all other appliance types

The mean value of the measured heat outputs obtained during the test in accordance with A.4.7 shall be equal to or greater than the nominal heat outputs declared by the manufacturer. 〈A1〉

6.7 Water heating output

The water heating output declared by the manufacturer shall not exceed the boilers's output measured under the test conditions described in A.4.7.

6.8 Space heating output

When tested in accordance with A.4.7, the space heating output declared by the manufacturer shall not exceed the test space heating output.

6.9 Refuelling intervals at slow or reduced combustion

If the manufacturer claims the appliance is capable of slow or reduced combustion, it shall be possible to maintain combustion, in accordance with A.4.8, over at least the minimum refuelling intervals given in Table 11, using one charge of test fuel of mass equivalent to that used for the performance test at nominal heat output and calculated as detailed in A.4.2.

〈A1〉

Table 11 - Minimum refuelling intervals or burning rate at slow or reduced combustion

Appliance type	Test fuel type (as detailed in Table B1)	Minimum refuelling interval or burning rate	
		Firedoors open	Firedoors closed
Continuous burning appliance	Wood logs or peat briquettes All other test fuels	no requirements 10 h	3 h 12 h
Intermittent burning appliance	Wood logs or peat briquettes All other test fuels	no requirements 10 h	no requirements 10 h
Kachelöfen or Putzöfen inset appliance	Wood logs or peat briquettes All other test fuels	Not applicable Not applicable	Burning rate to achieve (50 ± 10) % of nominal heat output Burning rate to achieve at least 12 h

〈A1〉

The manufacturer's declared value shall be verified when tested during the slow or reduced combustion test in accordance with A.4.8. If the refuelling interval(s) declared by the manufacturer is greater than the minimum refuelling interval(s) given in Table 11 then the declared value(s) shall be verified during the slow combustion or reduced combustion test.

6.10 Recovery test

At the conclusion of either the slow combustion or reduced combustion test periods it shall be possible to revive the fire satisfactorily and ignite a small fuel charge. The recovery shall be deemed to be satisfactory if, within not more than 20 min, the fuel charge is visibly ignited under the test conditions described in A.4.8.4 with a flue draught of $(10\ ^{+2}_{0})$ Pa.

6.11 User operations

All operations which the user carries out, including loading and emptying of the appliance, adjusting controls and de-ashing, shall be easy, safe and efficient. These requirements shall be assessed during all the performance tests.

〚A1〛 6.12 Accumulator heat input for Kachelöfen or Putzöfen inset appliances

The accumulator heat input shall be in accordance with the heat released when burning the test fuel load in kg given by the manufacturer when tested in accordance with A.4.10. 〚A1〛

7 Appliance instructions

7.1 General

Instructions written in the language of the country of intended destination of the appliance shall accompany the appliance and shall describe the installation, operation, maintenance and, if assembled on site, the 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”;
- full assembly instructions for the appliance, especially if supplied in parts;
- appliance model, number or type;
- nominal heat output in kilowatts or watts for each type of recommended fuel;
- water heating output in kilowatts or watts for each type of recommended fuel if appropriate;
- an indication of the heat released to the room in which the appliance is installed for each type of recommended fuel;
- maximum operating water pressure in bar, where applicable;
- mass of the appliance in kilograms;

- any necessary safety clearance distances from combustible materials and/or any other recommendations for protective measures to protect the building construction against the risk of fire;

- requirements for the supply of combustion air and where necessary the ventilation and air supply requirements for simultaneous operation with other heating appliances;

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

- the need for any air inlet grilles to be so positioned that they are not liable to blockage;

- minimum chimney draught requirements (in Pa) for nominal heat output for both open and closed firebox conditions, where applicable;

- [A2] flue gas mass flow in grams per second for both open and closed firebox operations as specified by the manufacturer, where required by national/local regulation (or alternatively the nominal heat output and the appliance efficiency and mean CO_2 concentration when operating at nominal heat output should be given for all test fuel types); [A2]

- the mean flue gas temperature directly downstream of the flue spigot/socket in °C at nominal heat output for both open and closed firebox conditions, where applicable;

- advice on the need to provide access for cleaning the appliance and the flue gas connector and the chimney flue;

- installation of cut-off and damper devices, where applicable;

- requirements for the installation space within the surround and outside the surround in the radiation area, taking outcoming convective hot air into consideration as well as the surface temperature of the surround;

- the floors: “the appliance shall be erected on floors with an adequate loadbearing capacity and if an existing construction does not meet this prerequisite, suitable methods (e. g. load distributing plate) shall be described to show how it can be achieved”;

- for inset appliances, in all cases the minimum dimension of the required builder’s opening and/or firefront opening in the surround;

- the water capacity of any boiler and instructions for fitting a drain-cock in the lowest part of the system (where applicable);

- the setting of the temperature controller and method of adjusting the “cold” setting distance;

- advice on a means of dissipating excess heat from the boiler, such as using a radiator;

- any commissioning instructions, as appropriate;

- the installation and operation of any control and safety equipment.

[A1] - instructions for the installation of the accumulator (dimensions, assembly) and parameters for calculation;

- accumulator heat input. [A1]

[A2] - advice on the installation of any air grilles, especially in relation to the temperature of surrounding walls, floor, ceiling or other structure around the appliance. [A2]

7.3 User Operating Instructions

The user 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";

- national and local operation conditions particular to the country in which it is to be distributed and on the permitted type of fuels;

- a list of the types and sizes of recommended fuels in accordance with the requirements of this standard;

- any modifications necessary to the appliance and/or to the operation of the appliance when using different fuels;

- refuelling instructions, including the maximum fuel mass of recommended fuels;

- instructions for the safe and efficient operation of the appliance including the ignition procedure;

- advice that the appliance shall not be used as an incinerator and that non-recommended fuels including liquid fuels shall not be used;

- advice on the correct operation of any adjusting devices and controls;

- correct operation for seasonal use and for adverse flue draught or weather conditions particularly where there is the potential for freezing;

- warning that the firebox must always be closed except when refuelling to prevent fume spillage, unless the appliance in question is intended to be operated open;

- advice on the correct operation with open firebox, where applicable;

- advice on the correct operation of any thermal discharge control or other control or safety equipment, where applicable;

- ventilation requirements for simultaneous operation with other heating appliances;

- advice on the regular cleaning of the appliance, flue gas connector and chimney flue and highlight the need to check for blockage prior to lighting after a prolonged shutdown period;

- instructions on ensuring the adequate provision of combustion air and ventilation air and safe removal of flue gases;

- instructions on simple fault finding and the procedure for the safe shut down of the appliance in event of malfunction e.g. overheating, interruption of water supply;

- a warning that the appliance especially the external surfaces will be hot to touch when in operation and that due care will need to be taken;

- need to adhere to any necessary safety clearances from combustible materials and guidance on protecting against the risk of fire in and outside the radiation area;

- warning against any unauthorized modification of the appliance;

- a recommendation to use only replacement parts recommended by the manufacturer;

- advice about action in the event of a chimney fire;

- advice whether the appliance is capable of continuous or intermittent operation and instructions on how this is achieved.

[A1] - instructions for use of the accumulator. [A1]

[A2] - advice on the adjustment of any air grilles, where fitted. [A2]

8 Marking

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

- the manufacturer's name or registered trademark;

- the type and model number or designation to enable the appliance to be identified;

- the nominal boiler (where relevant) and space heating output in kilowatts, or a range of outputs (dependent on fuel types, as applicable);

- the number of this European standard ;

- [A2] the measured CO concentration at 13 % oxygen content and the determined appliance efficiency at nominal heat output, as defined in 6.3 and 6.4 respectively; [A2]

- the permissible maximum water operating pressure [in bar], if applicable;

- "read and follow the operating instructions";

- "use only recommended fuels";

- whether the appliance is capable of continuous or intermittent operation.

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

[A1] The data plate shall identify the category of construction type for Kachelöfen or Putzöfen inset appliances as follows:

a) inset designed for the burning of coal products only: Inset EN 13229 – C;

b) inset designed for the burning of wood only: Inset EN 13229 – W;

c) inset designed for burning both wood and coal: Inset EN 13229 – CW;

Inset appliances with accumulation shall bear the supplementary letter "A" as follows:

d) inset with accumulation designed for burning both wood and coal: Inset EN 13229 – CWA. [A1]

A2

9 Evaluation of conformity

9.1 General

The compliance of an inset or open fire appliance with the requirements of this standard and with the stated values shall be demonstrated by:

- type testing;
- factory production control by the manufacturer, including product assessment.

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 12 and Table 13, is/are common to all appliances within that family.

9.2 Type testing

9.2.1 Initial type testing

Initial type testing 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 the manufacturer shall provide a written declaration to this effect.

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 12 and Table 13) then the production appliance itself shall be subjected to further type testing as detailed in 9.2.2.

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 13 then the production appliance itself shall be subject to further type testing as detailed in 9.2.2. 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 in assessing continuing conformity to type. A2

A2
For a family or range of appliance 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 type testing from a product range based upon their nominal heat outputs as representing such a family then the appliances having the lowest and highest claimed nominal heat outputs shall be tested together with sufficient appliances chosen from within the range such that the ratio of nominal heat output between each of 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 12 and Table 13. The list of characteristics in Table 12 and Table 13 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 (eg 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 will be the worst scenario case and will demonstrate the safety of the range as regards surface temperature and safety of adjacent combustible materials.

Where the manufacturer claims conformity 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 and to the list of characteristics detailed in Table 12 and Table 13.

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).

9.2.2 Further type testing

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 12 and Table 13, the type tests shall be repeated for the appropriate characteristic(s).

It shall be permissible for this further 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. A2

A2

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 performance characteristics detailed in Table 13 together with the list of characteristics detailed in Table 12. The list of characteristics in Table 12 and Table 13 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). A2

A2

Table 12 – Characteristics to take account of in deciding family of appliances

A	**Design, materials etc.**
☐	Exterior design, dimensions, weight etc.
☐	System for air convection/radiation
☐	Ashpan
☐	Materials
☐	Assembling methods, welding etc.
☐	Other issues _____
☐	Sketches/Drawings

B	**Combustion chamber**
☐	Dimensions of combustion chamber
☐	Flue baffle plate(s) arrangement
☐	Refractory material/insulation
☐	Front firebars/deepening plate
☐	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 _____

D	**Combustion air**
☐	Cross sections of air ducts (primary/secondary)
☐	Length of air ducts (primary/secondary)
☐	Number of bendings (primary/secondary)
☐	Air inlets in combustion chamber (primary/secondary)
☐	Pre-heating of air
☐	Air control system
☐	Other issues _____

E	**Integral fuel storage container**
☐	Size
☐	Protection against transfer of heat
☐	Insulation
☐	Other issues _____

F	**Integral boiler**
☐	Design, size of heating surface, heat output
☐	Materials
☐	Tapping sizes, position
☐	Waterway dimensions, venting etc.
☐	Strength, leaktightness of boiler shell
☐	Other issues _____

A2

A2

Table 13 – Performance characteristics to take account of in deciding family of appliances

Performance characteristic	Requirement clauses in this EN
Fire safety	4.2, 4.3, 4.7, 4.8, 4.10, 4.11, 4.15, 5.2, 5.5, 5.6, 5.9, 5.10, 6.11
Emission of combustion products	4.2, 4.3, 4.7, 4.8, 4.9, 4.14, 5.1, 5.4, 5.5, 6.2, 6.3
Surface temperature	4.2, 4.13, 5.2, 5.3, 5.6, 5.10
Electrical safety	5.9
Cleanability	4.5, 4.6, 4.10, 4.12, 4.15
Maximum operating pressure (applicable only where the appliance is fitted with a boiler)	4.2, 5.7, 5.8
Flue gas temperature	6.2
Mechanical resistance (to carry a chimney/flue)	4.2, 4.3
Thermal output/Energy efficiency	6.1, 6.4 to 6.10, 6.12

9.3 Factory production control (FPC)

9.3.1 General

The manufacturer shall establish, document and maintain a permanent FPC system and identify areas of responsibility to ensure that the products placed on the market conform with the stated performance characteristics. 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 9.3.2 to 9.3.8.

NOTE A permanent FPC system conforming to the requirements of either EN ISO 9001 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.

9.3.2 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.

9.3.3 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. A2

A2

9.3.4 Process control

The manufacturer shall identify and plan the production processes, which directly affect 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.

9.3.5 Product inspection, testing and evaluation

9.3.5.1 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 stated 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.

9.3.5.2 Materials of construction

a) Type – composition/specifications

b) Thickness

c) Dimensions

d) Finish.

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.

9.3.5.3 Insulation material

a) Specification of insulation material

b) Density value - thermal conductivity

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. A2

A2

9.3.5.4 Seals and sealant materials

a) Type - Including identification or composition, when a conformity certificate is not available.

b) 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.

9.3.5.5 Manufacturing checks

9.3.5.5.1 Construction and dimensions

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

a) flue spigot;

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;

j) front firebars;

k) boiler construction – dimensions, waterways, tappings etc (if fitted);

l) firebox/combustion chamber construction;

m) convection system.

9.3.5.5.2 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. A2

A2

9.3.6 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 is 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.

9.3.7 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.

9.3.8 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. A2

Annex A
(normative)
Test methods

A.1 Test environment

A.1.1 Ambient room temperature

The ambient room temperature of the test laboratory shall be measured at a distance from either side of the appliance represented by a point lying on a circumference of a circle with a radius of (1,2 ± 0,1) m traced from the mid-point of the side of the appliance, at a height of (0,50 ± 0,01) m above the platform scale and away from direct radiation.

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

A.1.2 Cross-draught

Cross-draught in the viscinity of the test appliance and its surroundings shall be not greater than 0,5 m/s measured at the location specified in A.1.1**.**

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

〚A1〛 In the case of Kachelöfen or Putzöfen inset appliances the test assembly shall consist of the test appliance installed in accordance with the appliance manufacturer's installation instructions into a test surround as specified in A.2.2, mounted on a platform scale that enables the fuel consumption to be measured such that the accuracy requirements specified in A.3 are met. The appliance shall be positioned so that the sides facing the walls of the test surround are at the manufacturer's minimum declared distance from the thermal insulation or radiation protection.

For all other appliance types the test assembly shall consist of the test appliance installed according to the manufacturer's installation instructions into a trihedron in accordance with A.2.3, mounted on a platform scale that enables the fuel consumption to be measured such that the accuracy requirements specified in A.3 are met.

NOTE The appliance should be installed either directly into the trihedron in the case of a free standing appliance, or in an arrangement simulating the construction specified by the appliance manufacturer in the case of inset appliances other than Kachelöfen or Putzöfen inset appliances. 〚/A1〛

[A1] The appliance shall be positioned so that the sides facing the trihedron walls are at the manufacturer's minimum declared distance from combustible material.

A measurement section constructed in accordance with A.2.4 shall be provided with means for determining the flue gas temperature in accordance with A.2.4.2, the flue gas composition in accordance with A.2.4.3 and the applied flue draught in accordance with A.2.4.4. The appliance flue spigot/socket shall be connected by means of an un-insulated flue gas connector and an insulated flue gas adapter to the measurement section in accordance with A.2.5.

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 An example of a typical installation for a Kachelöfen or Putzöfen inset appliance is given in Figure A.13 whilst examples of the installations of all other appliance types are given in Figures A.1 and A.2.

A.2.2 Test surround for Kachelöfen or Putzöfen inset appliances

The test surround shall consist of a hearth, a sidewall, a rear wall and test room ceiling at right angles to each other.

NOTE Example of the general arrangement and construction is given in Figure A.14.

For appliances with a horizontal outlet the rear wall shall have an opening through which the flue gas connector can pass, with a clearance of (150 ± 5) mm around the connector.

The test surround hearth and walls shall be constructed as illustrated in Figure A.5 or have a construction of equivalent thermal performance.

The maximum surface temperatures of the test surround including the temperature at convection air outlet shall be determined. These temperatures shall be measured using calibrated equipment meeting the accuracy requirements specified in A.3. The position of the measurement points shall be as illustrated in Figure A.6. The thermocouples shall be secured so that the junction is level with the surface as illustrated in Figure A.7. [A1]

A.2.3 Trihedron

[A2] The trihedron shall consist of a hearth, a side wall and a rear wall each at right angles one to the other. For those appliances where it is necessary to measure the temperature of the ceiling then a ceiling shall also be fitted in accordance with the manufacturer’s installation instructions.

NOTE 1 Examples of the general arrangement and opening construction of the trihedron are given in Figures A.3 and A.4. An example of an installation with walls and ceiling is given in Figure A.15.

The trihedron hearth and walls and/or ceiling, if required, shall be constructed as illustrated in Figure A.5 or have a construction of equivalent thermal performance. The trihedron shall extend laterally beyond the appliance’s external dimensions by at least 150 mm, and vertically by at least 300 mm above the top most surface of the appliance. [A2]

[A2] For appliances with a horizontal outlet the rear wall shall have an opening through which the flue gas connector can pass, with a clearance of (150 ± 5) mm around the connector.

The maximum surface temperatures of the trihedron test hearth and walls and/or ceiling shall be determined. These temperatures shall be measured using calibrated equipment meeting the accuracy requirements specified in A.3. The position of the measurement points shall be as illustrated in Figure A.6. However only sufficient number of those measurement points in and around the hottest zone need be fitted with calibrated thermocouples and used for measurement purposes provided it is ensured that the maximum surface temperature achieved shall be recorded. Each thermocouple shall be secured so that its junction is level with the trihedron surface as illustrated in Figure A.7.

NOTE 2 Other measurement equipment similar to thermocouples can be used provided it is ensured that the actual maximum surface temperatures of the trihedron test hearth and walls are measured and recorded and that the equipment used is calibrated such that it meets the accuracy requirements specified in A.3.

If the highest temperature is measured at the periphery of the trihedron and/or ceiling then the trihedron floor or walls and/or ceiling shall be extended by at least 150 mm beyond the point of highest temperature. [/A2]

[A1] A.2.4 Measurement section

A.2.4.1 General arrangement

The general constructional details and some details of the measurement section are shown in Figure A.8.

The measurement section shall be provided with means of measuring the temperature and composition of the flue gas and also with means of measuring the applied flue draught pressure as detailed in A.2.4.2 to A.2.4.4.

The measurement section shall be fully lagged with 40 mm thick mineral fibre (e.g. rockwool) 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.9 and A.10 and be sized in accordance with the diameter of the flue spigot/socket of the appliance.

A.2.4.2 Flue gas temperature measurement

The flue gas temperature shall be measured by a sensing element e.g. a thermocouple located inside a suction pyrometer probe as shown in Figure A.8, 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 between (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.8. [/A1]

[A1] 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. [A1]

[A2] 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. [A2]

[A1] A.2.4.3 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.2.4.4 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.8. The end of the tube shall be sealed flush with the inner wall of the measurement section.

A.2.5 Connection of appliance to measurement section

The appliance flue spigot/socket shall be connected to the measurement section specified in A.2.4 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.2.4.1.

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 be (350 ± 10) mm long.

NOTE Some general arrangements are shown in Figures A.1, A.2, A.9, A.10 and A.14 as appropriate to the appliance type. [A1]

A.2.6 Water circuit for appliances with boilers

The water circuit for appliances with boiler shall consist of a constant head water flow circuit of a design which maintains a flow of water constant to within ± 5 % of the set flow rate. The circuit shall enable a mean outlet temperature of (80 ± 5) °C to be achieved during the test at nominal output. The circuit shall have a means of measuring the water flow, in order to monitor the constancy of the flow rate. The water circuit used shall be either closed or open circuit provided the specified requirements for constancy of water flow rate and outlet temperature are met.

NOTE A suitable water circuit is shown in Figure A.11, but other suitable circuits may be used.

The water circuit shall be connected to the appliance by inlet and outlet pipes in a manner that allows free movement of the appliance for weighing purposes.

The temperature of the inlet and outlet water shall be measured using calibrated equipment inserted into the pipes, and meeting the uncertainty of measurement tolerances specified in A.3.

A.3 Measurement equipment

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

Table A.1 - Uncertainty of measurement

Parameter measured	Uncertainty of measurement
Gas analysis	
CO	≤ 6 % of the emission limit values in Table 2
CO_2	≤ 2 %
O_2	≤ 2 %
Temperature	
Flue gas	≤ 5 K
Ambient room	≤1,5 K
Water	≤ 0,5 K
Surface	≤ 2 K
Touchable Areas	≤ 2 K
Water flow	≤ 0,005 m^3/h
Cross-draught	≤ 0,1 m/s
Static pressure	≤ 2 Pa
Mass	
Fuel consumption	± 20 g
Residue	± 5 g
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 appropriate to the appliance type as specified in A.2, following the appliance manufacturer's installation instructions, and the appliance flue spigot/socket shall be connected to the measurement section as specified in A.2.5.

If the appliance is supplied in individual parts, the manufacture's specifications as given in the installation instructions shall be followed during assembly.

For appliances with a rear flue outlet, the flue gas connector shall pass through the test surround wall. The hole around the flue gas connector shall be filled with insulating material (see Figure A.4).

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 Calculation of fuel load

The fuel load for each firing regime shall be calculated with the formula :

$$B_{fl} = 360\,000 \times P_n \times t_b / (H_u \times \eta) \qquad (1)$$

where :

- B_{fl} is the mass of fuel load, in kg;
- H_u is the lower calorific value of the test fuel, as fired basis, in kJ/kg;
- η is the minimum efficiency according to this appliance standard or such higher value as declared by the manufacturer, in %;
- P_n is the nominal heat output, in kW;
- t_b is the minimum refuelling time or duration as declared by the manufacturer, in h.

A.4.3 Fuelling and de-ashing the fire

Select and prepare the test fuel according to Annex B.

Where the test fuels are fuels other than wood logs or peat briquettes load them onto the firebed so as not to pack them artificially.

For wood logs and peat briquettes refuel in accordance with the appliance manufacturer's refuelling instructions and take account of any recommendations regarding general orientation as well as log size in the case of wood logs.

For test fuels other than wood logs where de-ashing may not be necessary, the de-ashing procedure shall be thorough and shall be carried out in accordance with the manufacturer's operating instructions. For appliances with undergrate ash removal, observe the residue material falling through the grate bars by opening or removing the ashpit door/cover and continue de-ashing until burning fuel begins to be discharged.

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 according to 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 gases

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 concentrations of the products in the dry flue gas as specified in A.6.

A.4.4.3 Ambient room and flue gas temperatures

Measure both the flue gas temperature and ambient room temperature using calibrated instruments that meet the uncertainty of measurement requirements specified in A.3.

Measure and record both the ambient room temperature and the flue gas temperature 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.5.

A.4.5 Water heating output

A.4.5.1 General

For appliances fitted with boiler, measure the heat given to the water by a constant flow method using the flow circuit described in A.2.5. Measure the water flow rate and temperature rise across the boiler using calibrated equipment, which meets the uncertainty of measurement requirements specified in Table A.1.

A.4.5.2 Procedure

Set the water flow rate at a value determined according to the manufacturer's declared boiler heat output so that the requirements for the mean outlet temperatures as specified in A.2.5 are met during the test period. During the test, maintain this set flow rate to within ± 5 % by reference to the water flowmeter. Do not change the water flow rate to compensate for the short period variation in flow temperature that occurs after refuelling.

During the test period, measure and record the inlet and outlet temperatures, either continuously or at intervals not exceeding 1 min, in accordance with A.2.5.

At the end of the test period, calculate the mean rise in water temperature between the boiler inlet and outlet. Also calculate the mean water flow rate, in kg/h.

A.4.6 Combustible heat losses in the residue

For appliances with a bottomgrate and where the test fuel is any solid fuel except wood logs set aside the residue and allow it to cool. Determine and record the mass of the residue material, in kilograms, to the nearest 2 g. Analyse the residue and record its combustible constituents expressed as a percentage of the residue. Calculate the % heat loss in the residue according to the formula given in A.6.2.1.3.

If the test fuel is wood logs do not measure the carbon content of the residue. The combustible heat loss in the residue for wood logs shall be taken as 0,5 % points of efficiency.

A.4.7 Performance test at nominal heat output

A.4.7.1 General

〈A1〉 In the case of Kachelöfen or Putzöfen inset appliances the performance test at nominal heat output shall consist of three parts:

- an ignition and a dry heating, if the appliance is made of ceramic materials (see A.4.7.2);
- pre-test(s) period(s);
- a test period.

For all other appliance types the performance test at nominal heat output shall consist of two parts:

- an ignition and one or more pre-test period(s);
- a test period.

Except for Kachelöfen or Putzöfen inset appliances the test may start from cold or may follow another test provided that the fire has been de-ashed in accordance with A.4.3 at the termination of that test. If the test is started from cold the pre-test period shall be preceded by an initial ignition and pre-test at nominal heat output. In either case the appliance shall then be operated for a further pre-test period or periods before commencing the test period.

The duration of the pre-test period shall be sufficient to ensure that normal working conditions and a basic firebed are established.

The test period shall be preceded by a sufficient pre-test period or periods such that the mass of the basic firebed plus the ash from the fuel burned at the end of the test period shall not differ in value from that at the end of the previous period by more than 50 g. 〈A1〉

〈A1〉 When calculating the results of the nominal heat output test in according to A.5 then at least two separate test determinations of the necessary test parameters shall be obtained. These two determinations shall be obtained from at least two test periods conducted on either separate occasions and preceded by a pre-test period or from at least two consecutive refuelling charges. In the latter case the test results shall be determined separately for each refuelling interval.

In all valid tests the firebed shall be returned to its basic mass either at the end of each separate test period or at refuelling and the end of each refuelling interval for consecutive determinations. The mean value for the nominal heat output calculated from at least two separate valid test results shall be not less than the manufacturer's claimed value. For each separate test result to be valid it shall not differ from the mean value by more than $\pm$ 10 %.

Observe the static pressure throughout the entire test and if necessary adjust the applied flue draught to keep the static pressure within the normal flue draught value appropriate to the appliance type as detailed in 6.1.

A.4.7.2 Dry heating period for Kachelöfen or Putzöfen inset appliances

The dry heating period shall be of sufficient duration to ensure that the water content of ceramic materials does not effect the results of the weighing during the test period.

NOTE A dry heating period of 10 h or more is typical.

A.4.7.3 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 is set to the normal draught for the appliance type as given in 6.1, or such other value as given in the appliance installation instructions.

Record the initial platform scale reading. 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 a mass of test fuel sufficient to ensure a pre-test period. After refuelling, note the platform scale reading and record the mass of fuel added.

NOTE With an automatic ignition system, there is already a mass of test fuel present.

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. For appliances with boiler set the water flow rate to ensure the requirement for the mean water flow temperature specified in A.2.6 can be met.

Operate the appliance during the pre-test period at a burning rate which gives the manufacturer's claimed nominal heat output and ensure at least the mass of basic firebed is left at the end of this period.

End the ignition and pre-test period when the reading on the platform scale shows that the mass of basic firebed plus the ash from the fuel burned is achieved. Record the reading of the platform scale. 〈A1〉

[A1] A.4.7.4 Test period

When the test fuel is a fuel other than wood logs de-ash the fire, empty and replace the ashpan. Record the total mass of the test installation as measured by the platform scale. Load the appliance with the calculated mass of test fuel as detailed in A.4.2. 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.2.4.

Measure and record the surface temperatures of any operating knobs intended to be operated without the use of a tool and the temperature in any integral fuel store. The temperatures shall be measured at intervals of such duration as to ensure that the maximum temperatures achieved are recorded.

In the case of Kachelöfen or Putzöfen inset appliances also measure and record the temperature of the test surround and at the air grilles either continuously or at regular intervals of not more than 1 min to ensure that the maximum temperatures achieved are recorded.

For all other appliance types measure and record the temperatures of the trihedron test hearth and walls, either continuously or at regular intervals of not more than 1 min to ensure that the maximum temperatures achieved are recorded.

End the test period when the reading of the platform scale shows that the mass of the basic firebed plus the ash from the fuel burned is the same as that recorded at the end of the pre-test period. At the end of the test period, record the reading of the platform scale. If using a test fuel other than wood logs, de-ash the fire and empty and replace the ashpan, retaining the residue material for the determination of undergrate combustible loss in accordance with A.4.6. Record the reading of the platform scale. Record the duration, in minutes, of the test period. [A1]

[A2] The actual measured test duration in at least one of the tests shall equal or exceed either the minimum test duration specified in Table 4 or such higher minimum value specified by the manufacturer. Also the actual measured nominal heat output in at least one of the tests shall equal or exceed the manufacturer's 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 Table 4 or such higher minimum value specified by the manufacturer, then determine by way of a comparitive calculation whether, at the manufacturer's declared nominal heat output, the required minimum test duration would theoretically have been achieved or whether, at the minimum test duration the manufacturer's declared nominal heat output would theoretically have been achieved. [A2]

[A1] 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. [A1]

A.4.8 Slow combustion, reduced combustion and recovery test

A.4.8.1 General

The test shall start either from cold or shall follow the nominal heat output test, provided the fire has been de-ashed in accordance with A.4.3 at the termination of the test.

If the test is started from cold, the slow or reduced combustion pre-test periods shall be preceded by an ignition and pre-test period at nominal heat output appropriate to the appliance type in the same manner as that described in A.4.7.2. In either case, operate the appliance for further period(s) at reduced output in accordance with A.4.8.2 before commencing the test periods.

The pre-test period at nominal heat output and the further pre-test at low output may not be necessary for wood. For wood, if started from cold, the test period may begin when the basic firebed is reached after a minimum of one hour ignition period.

The duration of the test period or the burning rate requirements in the case of Kachelöfen or Putzöfen inset appliances shall be as specified in Table 11.

Observe the static pressure in the measurement section throughout the entire test and adjust the applied flue draught, if necessary, to keep the static pressure within the appropriate test value for the appliance type as detailed in 6.1.

Set the primary air opening and secondary air controls appropriate to the test fuel being used for the slow or reduced combustion test in accordance with the appliance manufacturer's operating instructions. If the appliance is fitted with a thermostatic primary air control the test shall be carried out with the thermostatic control in operation.

A.4.8.2 Pre-test period

At the end of the initial and pre-test period, de-ash the fire if this was not already done. Load the appliance with the calculated mass of test fuel in accordance with A.4.2.

Adjust the applied flue draught so that the static pressure in the measurement section is set to the appropriate test value required for slow or reduced combustion as detailed in 6.1.

Load the appliance with the appropriated mass of test fuel to ensure a sufficient pre-test period.

In the case of Kachelöfen or Putzöfen inset appliances reduce the heat output by reducing the setting of the primary air control in stages until the burning rate is either (50 ± 10) % of the measured burning rate at nominal heat output for test wood logs and peat briquettes or approximately 33 % of the measured burning rate at nominal heat output for other test fuels.

For all other appliance types reduce the heat output by reducing the water flow rate (for appliances with boiler only) and/or the setting of the primary air control at stages until the burning rate does not exceed either 33 % of the measured burning rate at nominal heat output for test wood logs or peat briquettes or 25 % of the measured burning rate at nominal heat output for other test fuels, or such lower burning rate level for slow or reduced combustion operation stated in the appliance operating instructions.

If the flow temperature exceeds 85 °C for appliances with boiler then adjust the thermostatic primary air control setting and/or the water flow rate to reduce the flow temperature to below 85 °C.

Begin the test period when the required burning rate is achieved and stable conditions have been maintained for a period of not less than 15 min. This is not necessary for wood.

A.4.8.3 Test period

Record the reading on the platform scale. If necessary refuel the appliance with further test fuel so that the amount of fuel calculated in accordance with A.4.2 or such lesser amount of fuel specified by the manufacturer in the operating instructions is present at the start of the test period.

Allow the appliance to operate for the test period, under the conditions established at the end of the pre-test period without further attention.

In the case of Kachelöfen or Putzöfen inset appliances measure and record the temperature of the test surround either continuously or at regular intervals of not more than 1 min to ensure that the maximum temperatures achieved are recorded.

For all other appliance types measure and record the temperature of the trihedron test hearth and walls either continuously or at regular intervals of not more than 1 min to ensure that the maximum temperatures achieved are recorded.

For continuous burning appliances, the mass of firebed at the end of the test shall be at least the same as the basic firebed left at the end of the pre-test period.

For intermittent burning appliances with solid mineral test fuel, at least a sufficient basic firebed shall be available to allow recovery, although in this case it need not to be the same as that at the end of the pre-test period.

For Kachelöfen or Putzöfen inset appliances using solid mineral test fuel, end the test when the mass of the basic firebed is the same as the basic firebed left at the end of the pre-test period.

For Kachelöfen or Putzöfen inset appliances using wood logs and peat briquettes end the test when at least a sufficient firebed to allow recovery is available.

At the end of the test period, record the reading of the platform scale and the duration of the test period.

A.4.8.4 Recovery test period

A.4.8.4.1 Kachelöfen or Putzöfen inset appliances

At the end of the slow combustion test period, reset the appliance controls in accordance with the manufacturer's operating instructions to give the nominal heat output. Adjust the applied draught so that the static pressure in the measurement section is set to (15 ± 2) Pa. De-ash the firebed in accordance with A.4.3, and add a refuel charge if necessary as follows:

- when using solid mineral test fuels, the refuel charge shall be at least 33 % of the nominal heat output test charge;

- when using wood logs or peat briquettes, the refuel charge shall be as indicated by the manufacturer's instructions.

Record whether the fire recovers in accordance with 6.10 and record the time taken.

A.4.8.4.2 All other appliance types

At the end of the slow or reduced combustion test period, reset the appliance controls in accordance with the appliance manufacturer's operating instructions to give the nominal heat output. Adjust the water flow rate, if relevant, to that required for nominal heat output operation. De-ash and/or refuel as necessary to allow the fire to recover. Record whether the fire recovers in accordance with 6.10 and record the time taken.

A.4.9 Safety tests

A.4.9.1 Temperature safety test for woodburning and multifuel appliances

A.4.9.1.1 General

This test shall be performed when the appliance is declared either to burn only wood or to burn both wood and solid mineral fuels.

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

The test fuel shall be fir timber with a moisture content of (15 ± 3) %; the nominal cross sectional sizes of the timber shall be 4 cm x 6 cm or 5 cm x 5 cm. The length of the timber shall be at least two thirds of the width of the firebox or two thirds of the depth of the firebox. If a grate is installed in the appliance, the length and the width of the profiles shall exceed the length and the width of the grate so that the grate is entirely covered with test fuel. These section timber pieces shall be put crosswise in a lattice formation so that the space between the timber pieces is not less than 1 cm.

Load the appliance with the calculated mass of timber pieces by the following formula:

$$B_{fl} = 400 \times S_c / H_u \quad (2)$$

where :

B_{fl} is the mass of fuel load in kilograms;

S_c is the surface area of the firebox floor in square metres;

H_u is the lower calorific value of the fuel as charged in megajoules per kilogram;

400 is the heat input in megajoules per square metre.

The appliance shall be refuelled and operated for successive test periods until the temperatures of trihedron test hearth and walls and the fuel storage container reach a steady state.

A.4.9.1.2 Ignition and test period

〚A1〛 Load the appliance with sufficient test fuel to ensure ignition of the fuel in accordance with the manufacturer's operating instructions. When the fuel is well alight, load the appliance with the calculated test load.

Adjust the applied flue draught to obtain a static pressure that is within $^{+2}_{0}$ Pa of the flue draught value appropriate to the appliance type as specified in 6.1. Set the combustion air controls at the maximum operating positions and adjust the secondary air controls to the normal setting for wood.

Observe the static pressure at approximately 15 min intervals throughout the entire test and adjust the applied flue draught, if necessary to keep the static pressure within $^{+2}_{0}$ Pa of the required test flue draught value.

When the basic firebed is achieved, a further test load is added. Maintain the combustion air control settings at their set operating positions allowing the highest heat output to be achieved.

In the case of Kachelöfen or Putzöfen inset appliances measure and record the following parameters:

- the temperatures on the test surround and at air grilles;

- the temperature in the fuel storage container, either continuously or at regular intervals of no more than 1 min.

For all other appliance types measure and record the following parameters:

- the temperatures on the test hearth and the walls of the trihedron;

- the temperature in the fuel storage container, either continuously or at regular intervals of no more than 1 min. 〚/A1〛

[A1] End the test period when the basic firebed is reached. Record the reading of the platform scale.

Refuel the appliance with a further test load and repeat the test. If the peak temperatures, during the previous test period are exceeded in the subsequent period, continue further refuelling until the maximum temperatures are reached.

Record the maximum temperatures achieved. [A1]

A.4.9.2 Temperature safety test for appliances burning solid mineral fuel only

A.4.9.2.1 General

This test shall consist of two parts:

- an ignition and pre-test period;
- a test period.

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

The test fuel shall be the fuel which gave the highest trihedron surface temperatures during the nominal heat output test conducted in accordance with A.4.7.

The appliance shall be refuelled and operated for successive test periods until the temperatures of trihedron and fuel storage container reach a steady state.

A.4.9.2.2 Ignition

Start the flue gas extraction system and adjust the applied draught so that the static pressure in the measurement section is within $^{+2}_{0}$ Pa of the flue draught value specified in 6.1.

Record the initial platform scale reading resulting from the mass of the test installation (appliance and test hearth, etc.).

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, begin the test.

A.4.9.2.3 Test period

De-ash the fire. Empty and replace the ashpan. Record the total mass of the test installation as measured by the platform scale.

Load the appliance with the calculated mass of test fuel as detailed in A.4.2. Adjust the applied flue draught within $^{+2}_{0}$ Pa of the required test value.

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

- the temperatures on the test hearth and the walls of the trihedron;
- the temperature in the fuel storage container.

End the test period when the basic firebed is reached. Record the reading of the platform scale.

Refuel the appliance with a further test load and repeat the test. If the peak temperatures during the previous period, are exceeded in the subsequent period, continue further refuelling until the maximum temperatures are reached.

Record the maximum temperatures achieved.

A.4.9.3 Temperature safety test for woodburning and multifuel appliances without doors

A.4.9.3.1 General

This test shall be performed when the appliance is designed to burn wood.

This test shall consist of an ignition and a test period.

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

The test fuel shall be fir timber with a moisture content of (15 ± 3) % ; the nominal cross sectional sizes of the timber shall be 4 cm x 6 cm or 5 cm x 5 cm. The length of the timber shall be at least two thirds of the width of the firebox or two thirds of the depth of the firebox. If a grate is installed in the appliance, the length and width of the profiles shall exceed the length and width of the grate so that the grate is entirely covered with test fuel. These section timber pieces shall be put crosswise in a lattice formation so that the space between the timber pieces is not less than 1 cm. The grids shall be put into the firebox and stacked to a level of up to two thirds of the fire-box opening.

The appliance shall be refuelled and operated for successive test periods until the temperatures of trihedron and fuel storage container reach a steady state.

A.4.9.3.2 Ignition and test period

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

Start the flue gas extraction system and adjust the applied draught so that the static pressure in the measurement section is within $^{+2}_{0}$ Pa of the flue draught values specified in 6.1.

Observe the static pressure at approximately 15 min intervals throughout the entire test and adjust the applied flue draught, if necessary.

When half of the mass of the initial charge is left, a further charge of test fuel shall be introduced up to two thirds of the firebox opening.

Measure and record :

- the temperatures on the test hearth and the walls of the trihedron;
- the temperature in the fuel storage container, measured either continuously or at regular intervals of no more than 1 minute.

End the test period when the basic firebed is reached. Record the reading of the platform scale.

Refuel the appliance with a further test load and repeat the test. If the peak temperatures during the previous period are exceeded in the subsequent period, continue further refuelling until the maximum temperatures are reached.

Record the maximum temperatures achieved.

A.4.9.4 Natural draught safety test

A.4.9.4.1 General

〚A1〛 The test assembly shall consist of the test appliance installed on a platform scale meeting the uncertainty of measurement requirements specified in Table A.1.

The appliance flue spigot/socket shall be connected to the natural draught measurement section illustrated in Figure A.12 by means of a flue gas connector and an insulated flue gas adapter in accordance with A.2.5 and operated with natural draught.

The measurement section shall be provided with means for determining the flue gas temperature in accordance with A.2.4.2, the flue gas composition in accordance with A.2.4.3 and the flue draught in accordance with A.2.4.4.

This test is carried out with any firedoors closed, and with each of the test fuels used for the performance test at nominal heat output as described in A.4.7.

The test shall consist of:

- an ignition and pre-test period;
- a test period.

If the appliance is equipped with a thermostat, the test shall be carried out with the thermostat in operation and be set to give the burning rate appropriate to the appliance type as detailed in A.4.9.4.2 and A.4.9.4.3.

A.4.9.4.2 Ignition and pre-test period

Record the initial platform scale reading resulting from the mass of the test installation (appliance and test hearth, etc.) and counterbalanced so that the uncertainty of measurement given in Table A.1 can be achieved. 〚/A1〛

[A1] Load the appliance with sufficient test fuel to ensure ignition of the fuel in accordance with the manufacturer's operating instructions. When the fuel is well alight, load the appliance with a sufficient quantity of test fuel to ensure that an appropriate pre-test period is achieved.

In the case of Kachelöfen or Putzöfen inset appliances the pre-test shall be carried out at a burning rate of (50 ± 10) % for wood logs and peat briquettes or ≤ 33 % for other test fuels of the consumption at nominal heat output. The pre-test period shall be continued for a period of not less than two hours at this burning rate until the reading on the platform scale shows that the mass of basic firebed is achieved. Record the reading of the platform scale.

For all other appliance types the pre-test period shall be carried out at a burning rate of (33 ± 5) % for wood logs and peat briquettes or (25 ± 5) % for all other test fuels of the burning rate at nominal heat output. The pre-test period shall be continued for a period of not less than 2 h at this burning rate until the reading on the platform scale shows that the mass of basic firebed and ashes is achieved. Record the reading of the platform scale. If the flow temperature exceeds 85 °C for appliances with boiler then adjust the thermostatic primary air control setting and/or the water flow rate to reduce the flow temperature below 85 °C. [A1]

A.4.9.4.3 Test period

[A2] De-ash the fire. Empty and replace the ashpan. Set the primary air controls at the minimum position and the secondary air control to that required for the test fuel being used in accordance with the manufacturer's operating instructions. Record the total mass of the test installation as measured by the platform scale. The test period starts immediately after taking and recording the platform scale reading.

Load the appliance with the calculated mass of test fuel in accordance with A.4.2. Measure and record the temperature and the composition of flue gas in accordance with A.4.4 and the static pressure in the measurement section. If the appliance is fitted with a boiler, measure and record the inlet and outlet water temperatures and the water flow rate as described in A.4.5.

Allow the appliance to operate with the air controls at their previously set positions.

The test ends either when the basic firebed is reached and the flue draught has not fallen below 3 Pa, or, if the flue draught has fallen below 3 Pa before the basic firebed is reached, the test ends after a further period of 10 h has elapsed from when the flue draught falls below 3 Pa (during which time the total quantity of CO in the flue gas is measured).

If 12 h after the start of the test period, the basic firebed has not been reached and the flue draught has not fallen below 3 Pa, de-ash the fire and allow the fire to continue burning until the basic firebed is reached.

The requirement of 5.4 is met if the flue draught has not fallen below 3 Pa throughout the test period.

If the flue draught has fallen below 3 Pa before the basic firebed has been reached then allow the fire to continue burning undisturbed for a further 10 h, and measure the total quantity of CO in the flue gas during this time. The test requirement of 5.4 is also met if within this 10 hour period the total quantity of CO in the flue gas, calculated to NTP is not greater than 250 dm^3 when calculated as detailed in A.6.2.8. [A2]

[A2] If the fire has gone out before the basic firebed has been reached the test is invalid. Repeat the test using different combustion air settings to ensure that the fire continues to burn until the basic firebed is reached.

Record the position of the air settings used (for inclusion in the user instructions). [A2]

A.4.9.5 Type pressure test for boilers

Connect the boiler's inlet or outlet water tappings to an hydraulic test rig capable of applying a test pressure of a least twice the maximum operating pressure declared by the manufacturer. Seal any unused boiler water tappings and apply a sustained test pressure of twice the manufacturer's declared maximum water operating pressure for a period of at least 10 min. Record whether or not the boiler shell or its water carrying components either leaked or became permanently deformed as a result of applying the test pressure.

A.4.9.6 Test for operation of thermal discharge control

A.4.9.6.1 General

This test shall be performed only on an appliance, which is fitted with a boiler designed to operate on a sealed system and where a thermal discharge control is fitted as part of the appliance.

This test shall consist of two parts:

- an ignition and pre-test period,
- a test period.

The boiler shall be connected to a water circuit as specified in A.2.5.

The test shall be carried out with any firedoor(s) closed, and with each of the test fuels used for the nominal heat output test as described in A.4.7.

The cold water used for dissipating the excess heat shall have a temperature between 10 °C and 15 °C and a pressure of (2 ± 0,1) bar.

A.4.9.6.2 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 is within $^{+2}_{0}$ Pa of the flue draught value that was used in the temperature safety test as specified in 6.1.

Record the initial platform scale reading resulting from the mass of the test installation (appliance and test hearth, etc.).

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 calculated mass of test fuel to ensure a pre-test period. After refuelling, note the platform scale reading and record the mass of fuel added.

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. Set the water flow rate through the boiler to a minimum flow rate which ensures that the requirement for the mean water flow temperature specified in A.2.5 can be met.

Operate the appliance during the pre-test period at a burning rate which gives the manufacturer's claimed nominal heat output and with both the water temperature thermostat and the thermal discharge control in operation. Ensure that at least the mass of basic firebed remains at the end of this period. The thermal discharge control shall not operate during this pre-test period.

End the ignition and pre-test period when the reading on the platform scale shows that the mass of basic firebed plus the ash from the fuel burned is achieved. Record the reading of the platform scale.

A.4.9.6.3 Test period

De-ash the fire. If necessary, empty and replace the ashpan. Record the total mass of the test installation as measured by the platform scale.

Load the appliance with the calculated mass of test fuel as detailed in A.4.2. Adjust the applied flue draught within $^{+2}_{0}$ Pa of the required test value.

Disable the water temperature thermostat and set all other controls, except those used only for start-up purposes, to the position that allows the highest water heating output to be achieved. Maintain the function of the thermal discharge control. Maintain the water flow at the same rate as used during the pre-test period.

Allow the appliance to continue operating in this mode whilst recording the temperature of the water flow from the boiler.

End the test when either the thermal discharge control operates or if the thermal discharge control does not operate when the flow temperature exceeds 105 °C. Record whether or not the thermal discharge control operated. If the control operated record the temperature of the flow water from the boiler when the thermal discharge control operated.

A.4.9.7 Operation with open firebox for the appliance types 2b) c) and 3 a) b) c) (see Table 1)

After completion of each of the following tests: A.4.7 and A.4.8, the flue draught pressure shall be set to a value of (6 ± 1) Pa. Load the appliance with the fuel load B_{fl} of A.4.2 and open the firedoor(s).

During the first hour after introduction of the fuel load, it shall be observed whether combustion gas escapes from the firebox.
In addition it shall be determined by smoke cartridges or other suitable facilities whether, at the upper edge of the firebox opening, a suction effect occurs into the firebox or combustion gas escapes from the firebox.

Furthermore, it shall be observed during the tests with an open firebox whether burning fuel drops out of the firebox.

A.4.10 Test to determine the basic data for the calculation of the performance of a heat accumulator

A.4.10.1 General

The test for accumulation 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 (approximately 10 min).

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 $\pm$ 2 Pa as detailed in 6.1.3.

A.4.10.2 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 is set to the normal draught for the appliance as given in 6.1.3.

Record the initial platform scale reading. 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 to ensure a pre-test period of about 10 min. After refuelling, note the platform scale reading and record the mass of fuel added.

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

Operate the appliance during the pre-test period at a burning rate which gives the manufacturer's claimed heat and ensure at least the mass of basic firebed is left at the end of this period.

End the ignition and pre-test period when the reading on the platform scale shows that the mass of basic firebed plus the ash from the fuel burned is achieved. Record the reading of the platform scale.

A.4.10.3 Test period

When the test fuel is a fuel other than wood logs de-ash the fire, empty and replace the ashpan. Record the total mass of the test installation as measured by the platform scale. Load the appliance with the mass of test fuel as given in the instructions of the manufacturer. 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.2.4.

Measure and record the temperature of the test surround and at air grilles 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 and the temperature in any integral fuel store.

[A1] The temperatures shall be measured at intervals of such duration as to ensure that the maximum temperatures achieved are recorded.

End the test period when the reading on the platform scale shows that the mass of the basic firebed plus the ash from the fuel burned is the same as that recorded at the end of the pre-test period. At the end of the test period, record the reading of the platform scale. If using a test fuel other their wood logs, de-ash the fire, empty and replace the ashpan, retaining the residues for the determination of undergrate combustible loss in according to A.4.5. Record the reading of the platform scale. Record in minutes, the duration of the test period.

A.5 Test results

For each test fuel used, record the results of the analysis parameters specified in B.2.2.

In the case of Kachelöfen or Putzöfen inset appliances calculate and record from at least two valid separate tests results, in accordance with A.6, the following parameters from the nominal heat output test:

- the mean total efficiency;
- the mean nominal heat output;
- the mean CO emission at 13 % O_2;
- accumulation heat output.

For all other appliance types calculate and record from at least two valid separate test 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 water (if a boiler is fitted);
- 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 manufacturer's claimed 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. [A1]

[A2] 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 either the minimum duration specified in Table 4 or such higher minimum value specified by the manufacturer, then determine by way of a comparitive calculation whether, at the manufacturer's declared nominal heat output, the required minimum test duration would theoretically have been achieved or whether, at the required minimum test duration the manufacturer's declared nominal heat output would theoretically have been achieved. If appropriate, record either the revised test duration or the recalculated nominal heat output. [A2]

[A1] 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 test surround. Also record the maximum temperature achieved in any integral fuel store, if fitted, and for Kachelöfen or Putzöfen inset appliances the temperatures at the air grilles.

Record whether it was possible to maintain slow combustion for the minimum periods specified in Table A.3, and whether recovery of the fire was possible. Record the time taken for the fire to recover.

Record whether or not the requirements for the natural draught safety test specified in 5.4 were met.

Record whether the materials, design and constructional requirements specified in Clause 4 were met. Record whether the manufacturer's instructions for the appliance meet the requirements specified in Clause 7 and whether the marking of the appliance meet the requirements specified in Clause 8.

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

Record the basic data for the calculation of the performance of the heat accumulator test detailed in A.4.10. For the calculation of the accumulator connected flueways in compliance with the tests stated in A.4.7 and, if applicable. A.4.10; the parameter to be recorded are the flue temperature directly in the back of the heat generator (see Figure A.13), the values necessary for the calculation of the flue gas mass flow and the flue draught in the measurement section according to Figure A.13. [A1]

A.6 Calculation methods

A.6.1 Notations and units used

The notations and units used in the calculations are given in Table A.2.

[A2]

Table A.2 - Notations and units used in calculations

Notation	Definition	Unit
A	Stoichiometric oxygen demand for the fuel	mol O_2/mol fuel
B	Mass of the test fuel fired hourly (as fired basis)	kg/h
b	Combustible constituents in material passing through the grate and in residue referred to mass of residue material	% of mass
C	Carbon content of test fuel (as fired basis)	% of mass
CO	Carbon monoxide content of the dry flue gases	% of volume
CO_2	Carbon dioxide content of the dry flue gases	% of volume
C_p	Specific heat of water	kJ/kg.K
Cr	Carbon content of the residue passing through the grate, referred to the quantity of test fuel fired. (Approximation : $Cr = R \times b / 100$)	% of mass
C_{pmd}	Specific heat of dry flue gases in standard conditions, depending on temperature and composition of the gases	kJ/K.m³
C_{pmH2O}	Specific heat of water vapour in standard conditions, depending on temperature	kJ/K.m³
c	Carbon content of the fuel (on dry ash free basis)	kg/kg
F	Mass of test fuel burned in ten hour test period (dry, ash free basis) but without correction for combustible constituents in the residue	kg
H	Hydrogen content of the test fuel (as fired basis)	% of mass
H_u	Lower calorific value of the test fuel (as fired basis)	kJ/kg
h	Hydrogen content of the fuel (on dry ash free basis)	kg/kg
M_w	Water flow rate	kg/h
m	Flue gas mass flow	g/s
m_h	Molar content of hydrogen	
m_o	Molar content of oxygen	
m_s	Molar content of sulfur	
N	Boiler water temperature rise	K
η	Efficiency	%
o	Oxygen content of the fuel (on dry ash free basis)	kg/kg
P	Total heat output	kW
P_{SH}	Space heat output	kW
P_w	Water heat output	kW
Q_a	Thermal 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 passing through the grate, 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 residue passing through the grate Q_r, referred to the calorific value of the test fuel (as fired basis)	%
s	Sulfur content of the fuel (on dry ash free basis)	kg/kg
R	Residue passing through the grate, referred to the mass of the fired test fuel	% of mass
T_b	Minimum refuelling interval or manufacturer's declared duration	h
t_a	Flue gas temperature	°C
t_r	Room temperature	°C
V_{COn}	Carbon monoxide volume	dm³
W	Moisture content of the test fuel	% of mass

[A2]

A.6.2 Formulae

A.6.2.1 Heat losses and efficiency

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

The efficiency is determined from these losses with the equation :

$$\eta = 100 - (q_a + q_b + q_r) \quad (3)$$

A.6.2.1.1 Thermal losses in the flue gas

$$Q_a = (t_a - t_r) \times [[(C_{pmd} \times (C - C_r) / (0{,}536 \times (CO + CO_2))] + [C_{pmH2O} \times 1{,}224 \times (9H + W) / 100]] \quad (4)$$

$$q_a = 100 \times Q_a / H_u \quad (5)$$

A.6.2.1.2 Chemical losses in the flue gas

$$Q_b = 12\,644 \times CO \times (C - C_r) / [\ 0{,}536 \times (CO_2 + CO) \times 100\ ] \quad (6)$$

$$q_b = 100 \times (Q_b / H_u) \quad (7)$$

A.6.2.1.3 Heat losses due to combustible constituents in the residue passing through the grate

$$Q_r = 335 \times b \times R / 100 \quad (8)$$

$$q_r = 100 \times Q_r / H_u \quad (9)$$

A.6.2.2 Total heat output

The total heat output is calculated from the mass of fuel burned per hour, the calorific value of the test fuel and the efficiency, using the formula:

$$P = (\eta \times B \times H_u) / (100 \times 3\,600) \quad (10)$$

A.6.2.3 Water heating output

The water heating output is calculated from the water flow rate, the water temperature rise and the specific heat of water, using the formula:

$$P_w = (C_p \times M_w \times N) / 3\,600 \quad (11)$$

A.6.2.4 Space heating output

The space heating output is calculated as the difference between the total heat output and the water heating output, using the formula:

$$P_{SH} = P - P_w \quad (12)$$

A.6.2.5 Flue gas mass flow

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

$$m = [\ B \text{ x } (1{,}3) \text{ x } (C\text{-}C_r) / (0{,}536) \text{ x } (CO_2 + CO)) + (\ 9\ H + W\ ) / 100\ ] / 3{,}6 \qquad (13)$$

A.6.2.6 [A2] CO content at 13 % oxygen [A2]

The mean values of the flue gas components such as oxygen (O_2), carbon dioxide (CO_2) and carbon monoxide (CO) over the test period are calculated as an allowable approximation of the data received from the instrument readings.

With this calculation method though, 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.

[A2] The CO content shall be calculated as follows:

1. 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.

2. The CO_{avg} value shall be converted to a CO content value based on a standardized oxygen content ($O_{2\ standardized}$) in the flue gas according to one of the following equations:

$$\text{CO content} = CO_{avg} \text{ x } \frac{21 - O_{2\ standardized}}{21 - O_{2\ avg}} \qquad (14)$$

$$\text{CO content} = CO_{avg} \text{ x } \frac{CO_{2max}}{CO_{2\ avg}} \text{ x } \frac{21 - O_{2\ standardized}}{21} \qquad (15)$$

For this standard the standardized oxygen content ($O_{2\ standardized}$) in the flue gas shall be taken as 13 %. The value of CO_{2max} shall be calculated as detailed in A.6.2.9. [A2]

NOTE Where the CO is measured on a volume basis (vol % or parts per million) and the CO concentration needs to be given by mass concentration (mg/m³n) the mean value COavg' should be changed as follows:

(a) if CO is measured as parts per million (ppm):

$$CO_{avg}\ (mg/m^3_n) = CO_{avg}\ (ppm) \text{ x } d_{co} \qquad (16)$$

(b) if CO is measured as percentage (vol %):

$$CO_{avg}\ (mg/m^3_n) = CO_{avg}\ (vol\%) \text{ x } d_{co} \text{ x } 10\ 000 \qquad (17)$$

where d_{co} is the density of carbon monoxide at standard condition [$d_{CO} = 1{,}25\ kg/m^3_n$]

A.6.2.7 Specific heat value of the combustion products

A.6.2.7.1 Specific heat of dry flue gases in standard conditions (C_{pmd})

The specific heat of the dry flue gases in standard conditions (C_{pmd}) is calculated according to the formula:

$$C_{pmd} = 3{,}6 \text{ x} \left(0{,}361 + 0{,}008 \text{ x} \left(\frac{t_a}{1000} \right) + 0{,}034 \text{ x} \left(\frac{t_a}{1000} \right)^2 \right.$$

$$+ \left(0{,}085 + 0{,}19 \times \left(\frac{t_a}{1000} \right) - 0{,}14 \times \left(\frac{t_a}{1000} \right)^2 \right) \times \left(\frac{CO_2}{100} \right)$$

$$\left. + \left(0{,}3 \; x \left(\frac{t_a}{1000} \right) - 0{,}2 \times \left(\frac{t_a}{1000} \right)^2 \right) \times \left(\frac{CO_2}{100} \right) \right) \qquad (18)$$

A.6.2.7.2 Specific heat of water vapour (C_{pmH2O})

The specific heat of water vapour (C_{pmH2O}) in the combustion products is calculated according to the formula:

$$C_{pmH2O} = 3{,}6 \times \left(0{,}414 + 0{,}038 \times \left(\frac{t_a}{1000} \right) + 0{,}034 \times \left(\frac{t_a}{1000} \right)^2 \right) \qquad (19)$$

A.6.2.8 Volume, at NTP, of carbon monoxide (V_{Con})

The volume, at NTP, of the carbon monoxide (V_{COn}) during the 10 hour period of the natural draught safety test is calculated in dm^3 according to the following formula:

$$V_{COn} = \frac{C \times F}{0{,}536 \times (CO_2 + CO)} \times CO \times 10 \qquad (20)$$

A2 A.6.2.9 Calculation of CO_{2max}

The value of CO_{2max} used in equation 15 is calculated as follows:

$$CO_{2max} = \frac{1}{[1 + m_s + A \times (79/21)]} \times 100 \qquad (21)$$

The values of A and m_s used in equation 21 are calculated as follows:

$$A = 1 + (m_h/4) - (m_o/2) + m_s \qquad (22)$$

$$m_s = (12/32) \times (s/c) \qquad (23)$$

where:

$$m_h = 12 \times (h/c) \qquad (24)$$

$$m_o = (12/16) \times (o/c) \qquad (25)$$

NOTE 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. A2

A.7 Test report

The test report, each page of which shall be numbered consecutively, shall specify the results of the testwork and any other additional information and shall contain at least the following details concerning the testwork undertaken on the appliance:

a) the name and address of the appliance manufacturer;

b) the name, serial number and description of the appliance;

c) a 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;

d) a 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;

e) a statement describing whether the installation and operating instructions comply with the requirements specified in Clause 7;

f) a copy of the marking information given on the appliance, and a statement whether the marking information conforms with the requirements specified in Clause 8;

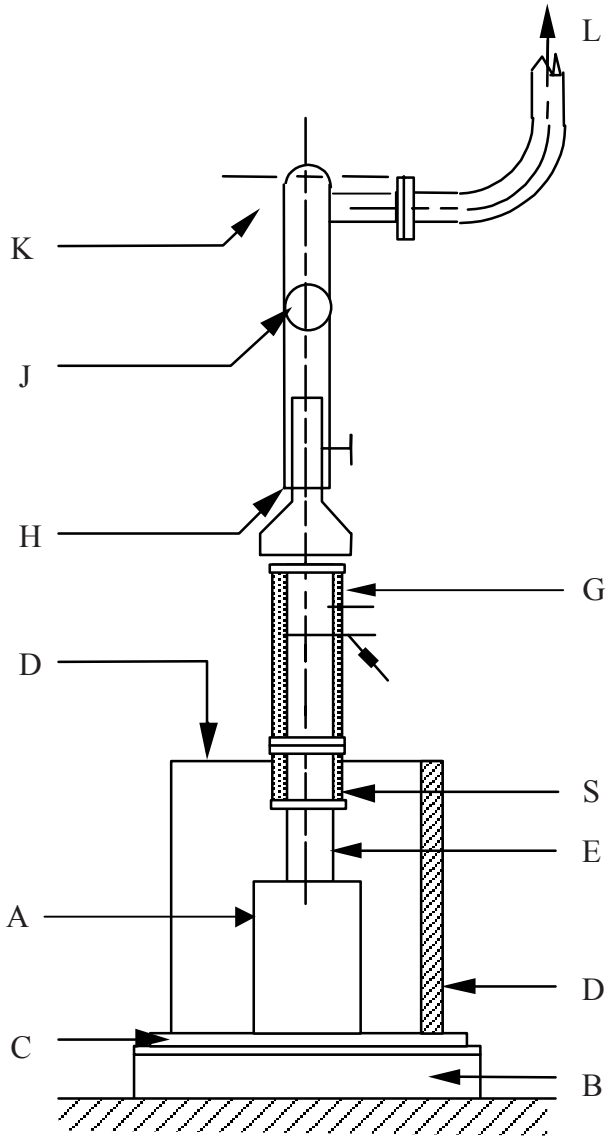
g) the name and address of the test laboratory;

h) a unique serial number for the report;

j) the date of issue of the report;

k) signature and legible name of the person taking responsibility for the content of the report;

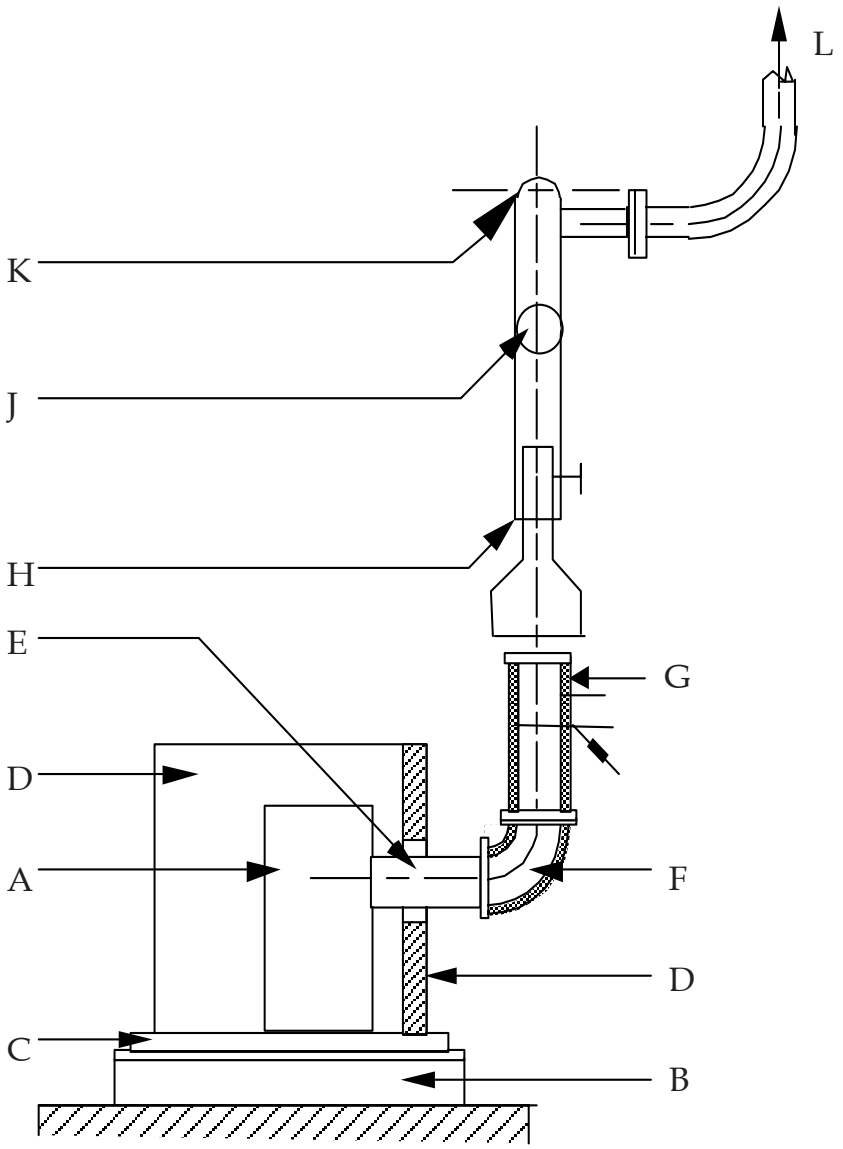
l) the analyses and specifications of the test fuels used during the testwork.



KEY

A	Appliance
B	Platform scale
C	Trihedron test hearth
D	Trihedron side wall(s)
E	Flue gas connector
G	Measurement section
H	Adjustable gather
J	Adjustable damper
K	Fan
L	Exhaust to atmosphere
S	Flue gas adaptor - straight

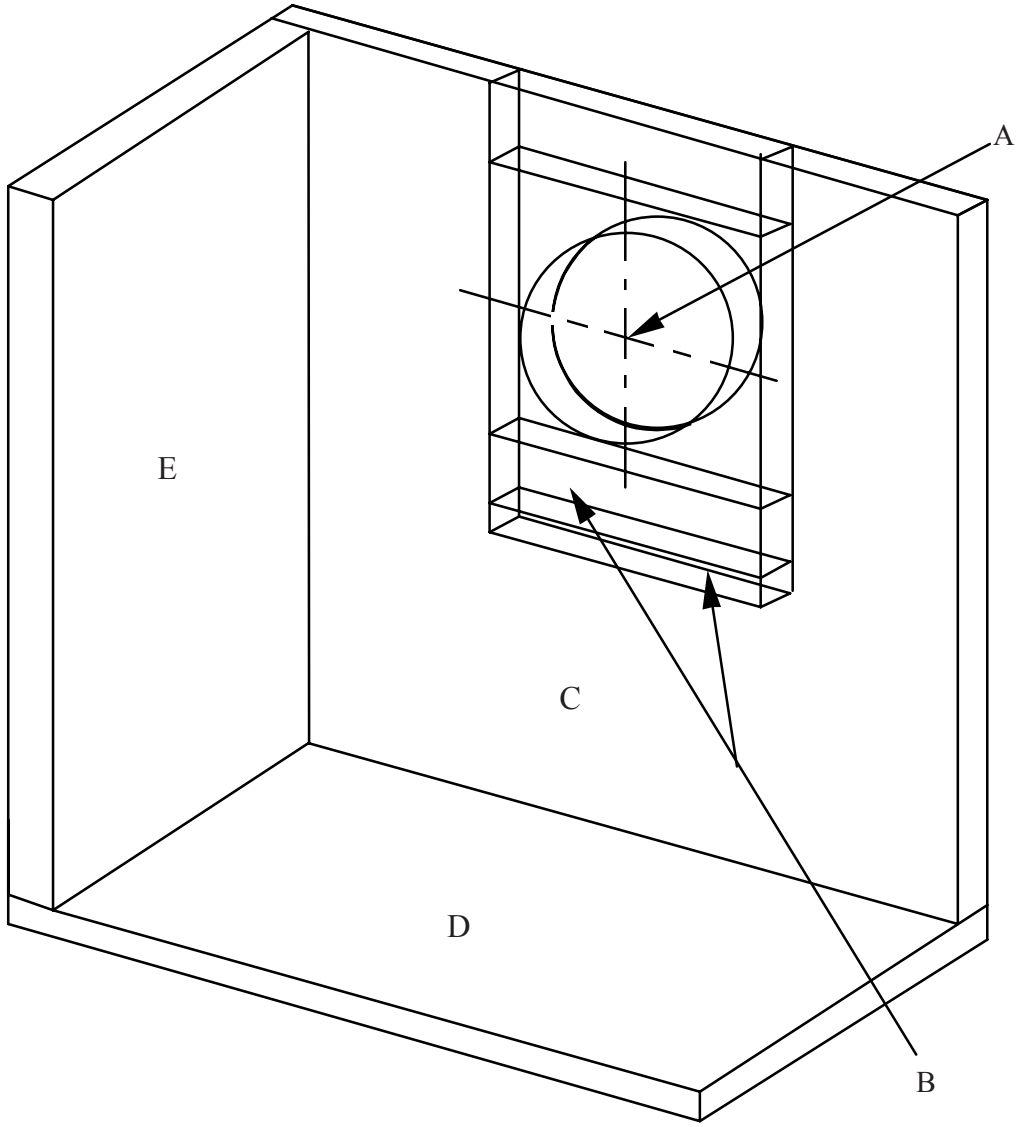
Figure A.1 - Example of installation of an appliance with vertical flue outlet in the test assembly



KEY

A	Appliance
B	Platform scale
C	Trihedron test hearth
D	Trihedron side wall(s)
E	Flue gas connector
F	Flue gas adaptor - bend
G	Measurement section
H	Adjustable gather
J	Adjustable damper
K	Fan
L	Exhaust to atmosphere

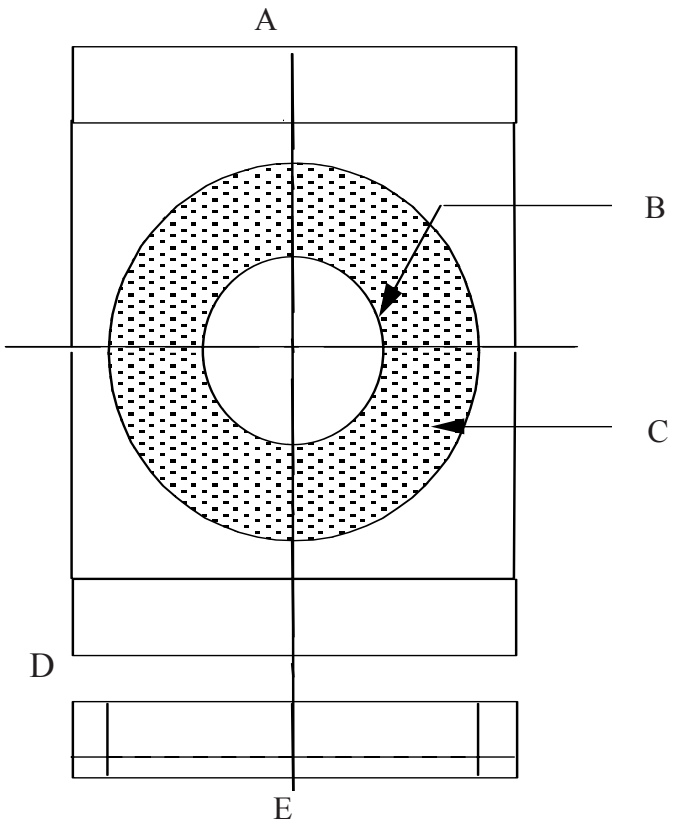
Figure A.2 - Example of installation of an appliance with horizontal flue outlet in the test assembly



KEY

A	Centre line of flue gas connector
B	Filler pieces
C	Rear wall
D	Test hearth
E	Side

Figure A.3 - View of trihedron showing general arrangement of side walls and test hearth

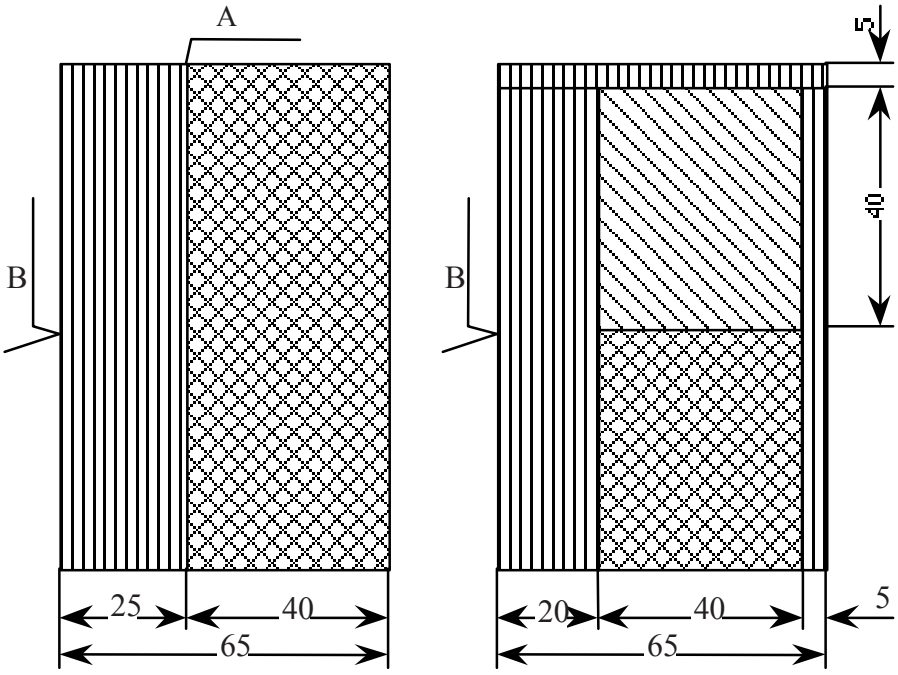


KEY

A	Elevation
B	Flue gas connector
C	Clearance of (150 ± 5) mm around flue gas connector filled with insulation
D	Same construction as Figure A.3
E	Plan view

Figure A.4 – Details of filler pieces for trihedron rear wall

Dimensions in millimetres
Tolerance on dimensions ± 1 mm



KEY

	A2 Plywood board A2
	Squared timber
	Insulation (fibre or plates) thermal conductivity 0,04 W/mK
A	Adhesive
B	Black cover

Figure A.5 - Cross section showing trihedron construction

Dimensions in millimetres
Tolerance on dimensions ± 1 mm

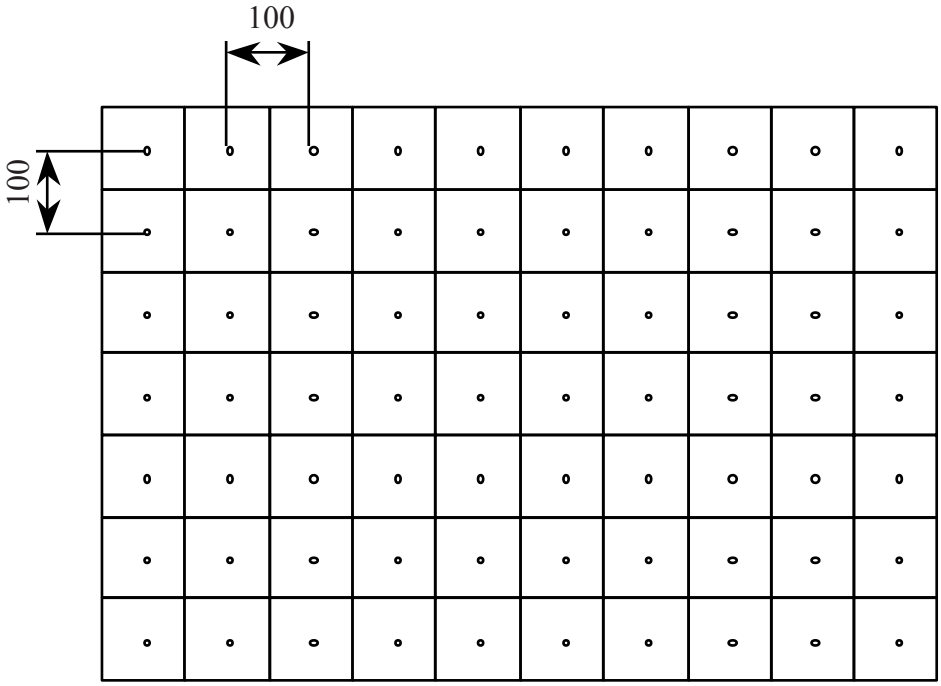
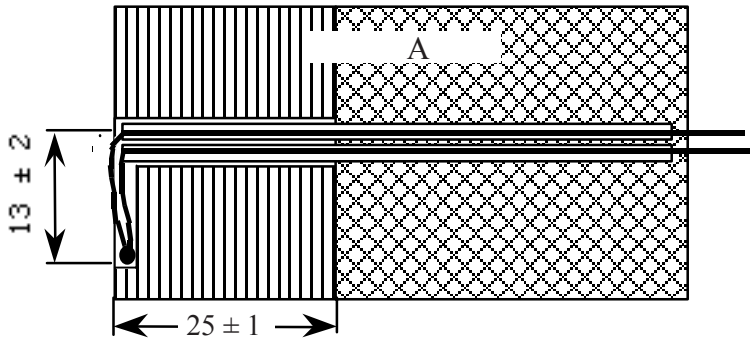


Figure A.6 - Plan view of trihedron hearth and walls showing position of measurement points

Dimensions in millimetres

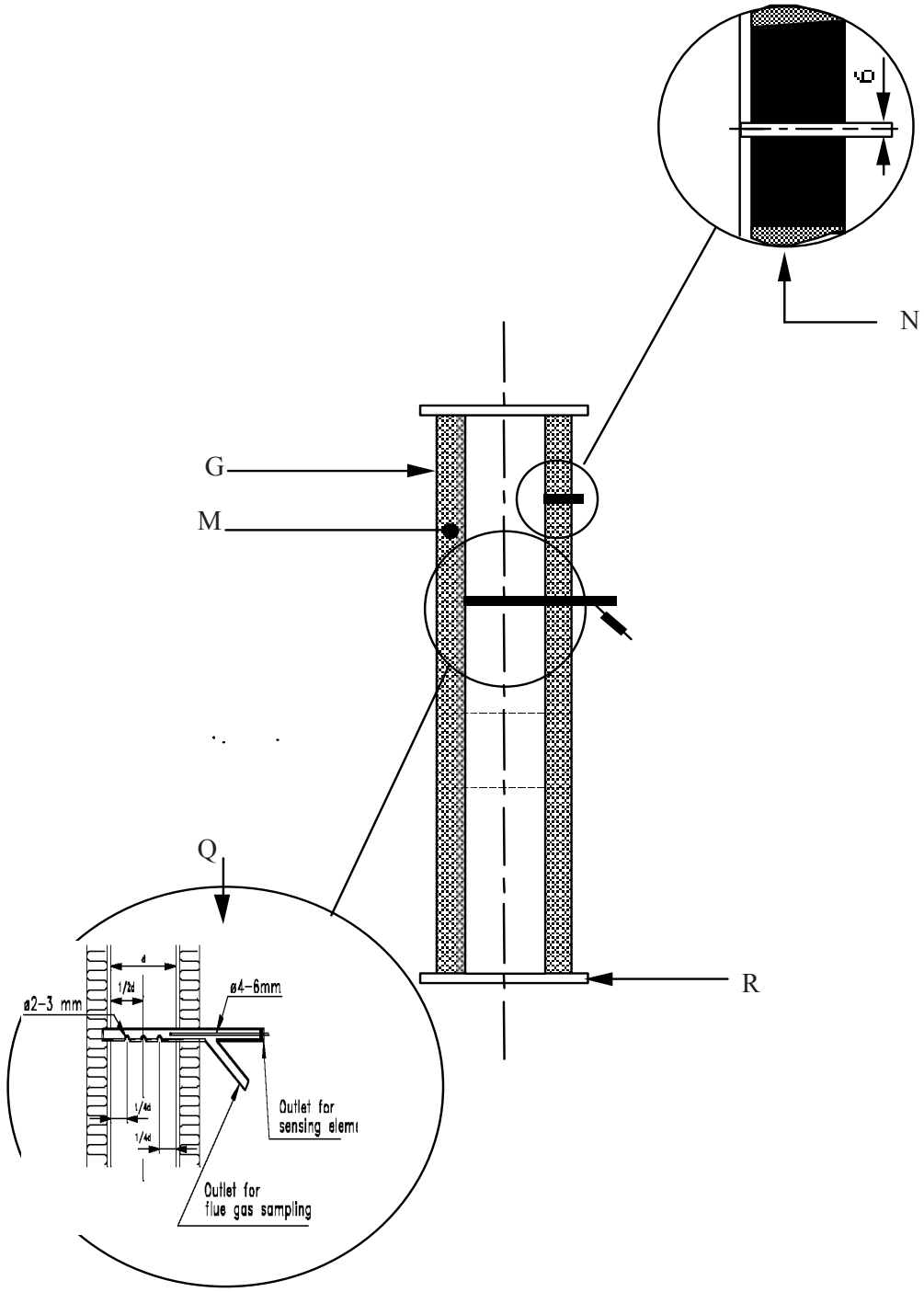


KEY

A	Trihedron wall

Figure A.7 - Details of thermocouples in trihedron wall

Dimensions in millimetres

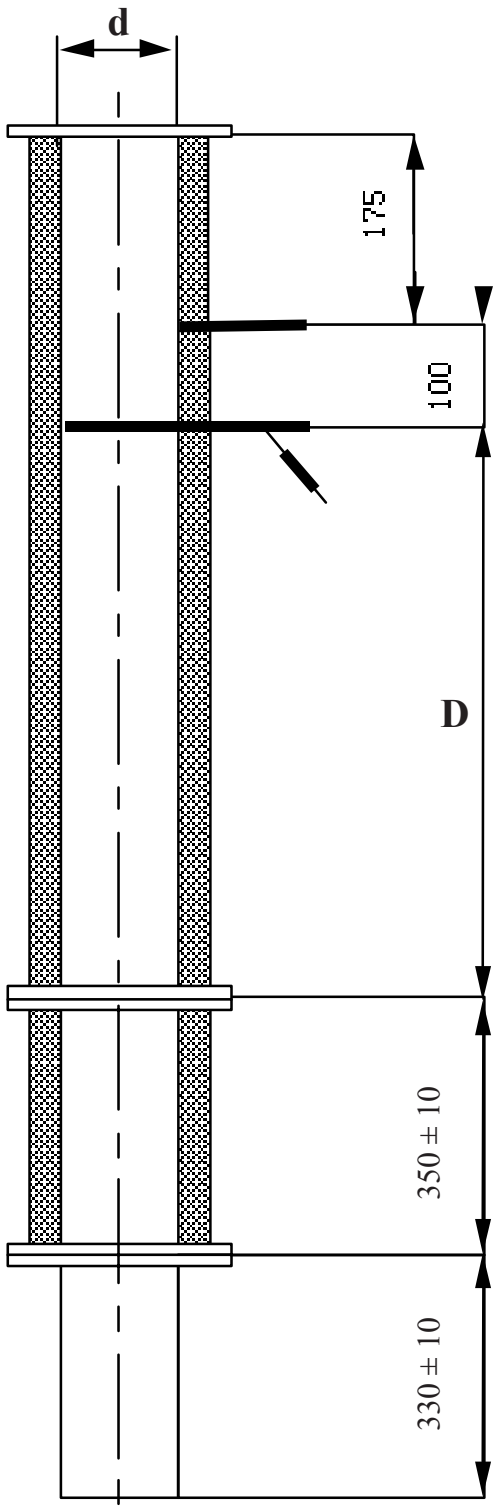


KEY

G	Measurement section
M	Insulation
N	Static pressure measurement
Q	Measurement of flue gas temperature and constituents
R	Flange

Figure A.8 - Construction and general arrangement of measurement section

Dimensions in millimetres



DIMENSIONS OF MEASUREMENT SECTIONS

Flue spigot/socket diameter ∅	d	D
≤ 180	150	750
180 < ∅ ≤ 250	200	1 000
> 250	300	1 500

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

Figure A.9 - Details and dimensions of measurement section for vertical flue outlet

Dimensions in millimetres

DIMENSIONS OF MEASUREMENT SECTION

Flue spigot/socket Diameter ∅	d	D
≤ 180	150	750
180 < ∅ ≤ 250	200	1000
> 250	300	1500

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

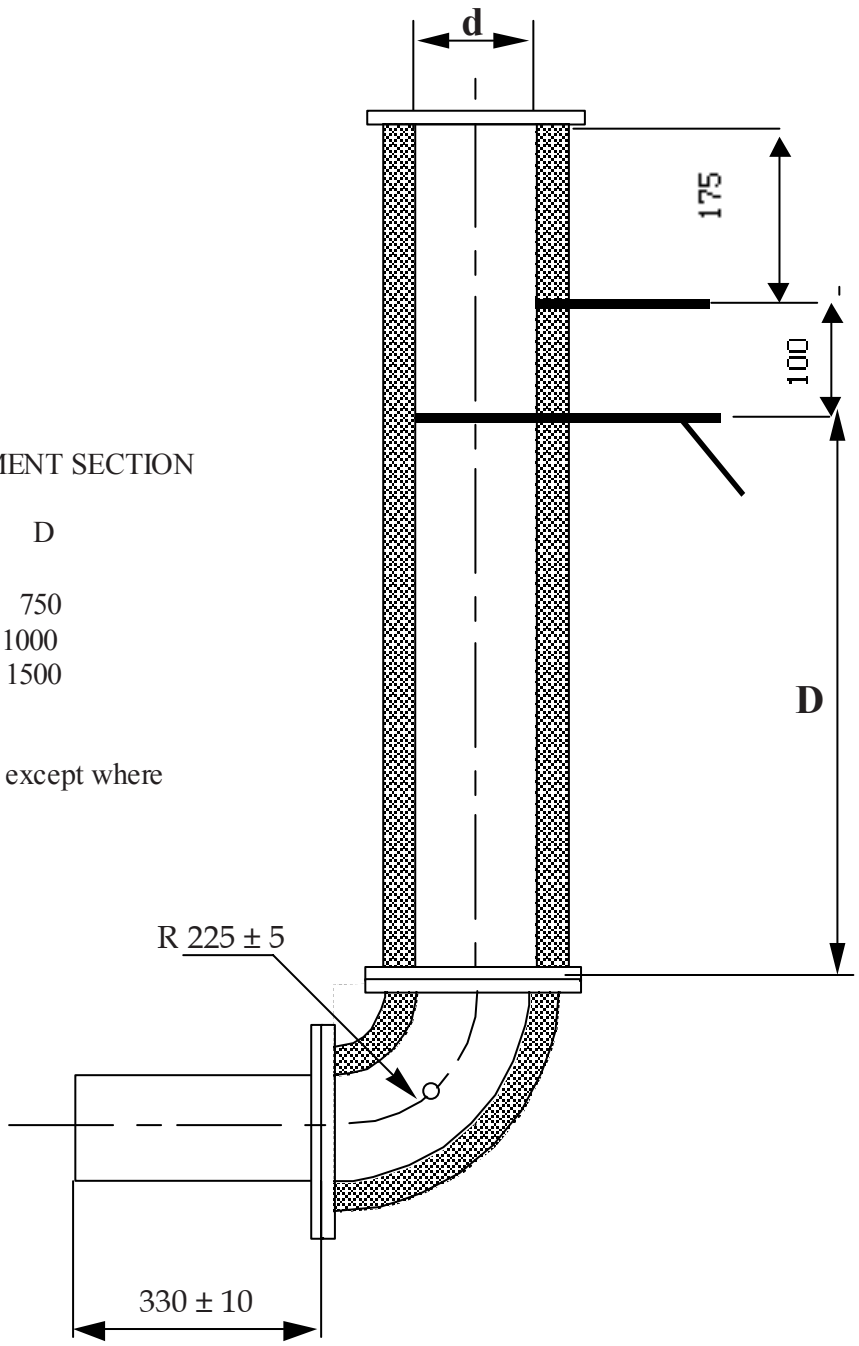
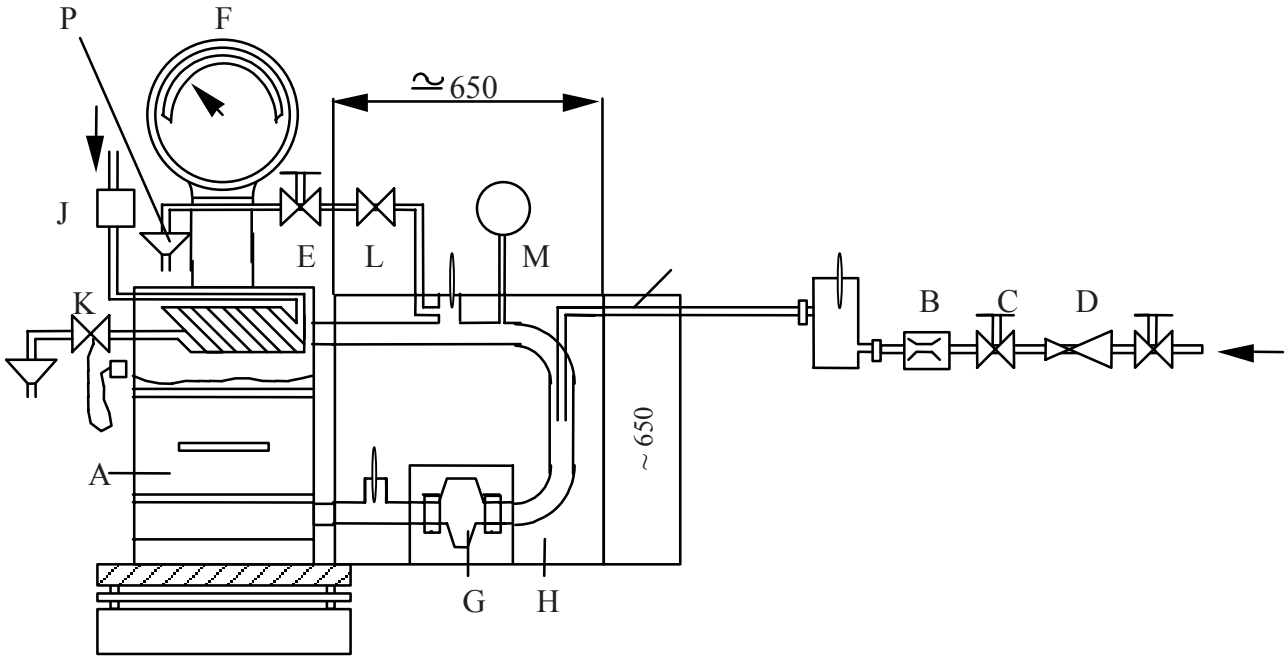


Figure A.10 - Details and dimensions of measurement section for horizontal flue outlet

Dimensions in millimetres



KEY

A Appliance with boiler
B Flowmeter
C Regulating valve
D Pressure reduction vessel
E Valve (cut off)
F Platform scale
G Circulation pump
H Steel-box insulated with 120 mm mineral wool or filled with scraps of cork
J Safety equipment
K Thermal discharge control)
L Safety valve)
M Pressure extension vessel) for pressurised systems
N Flexible connection)
P Drain)

Figure A.11 - Example of test installation for appliances with water circuit

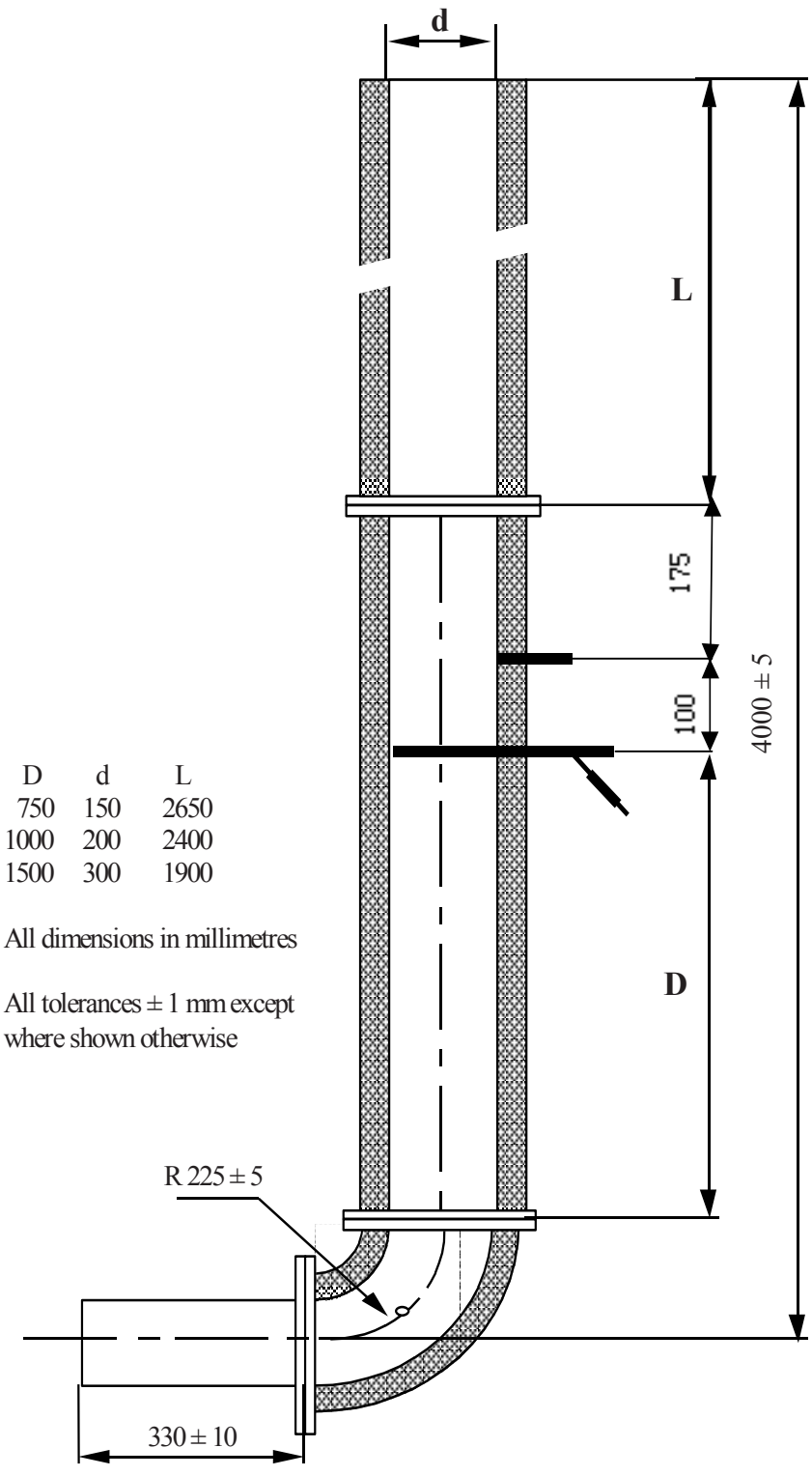
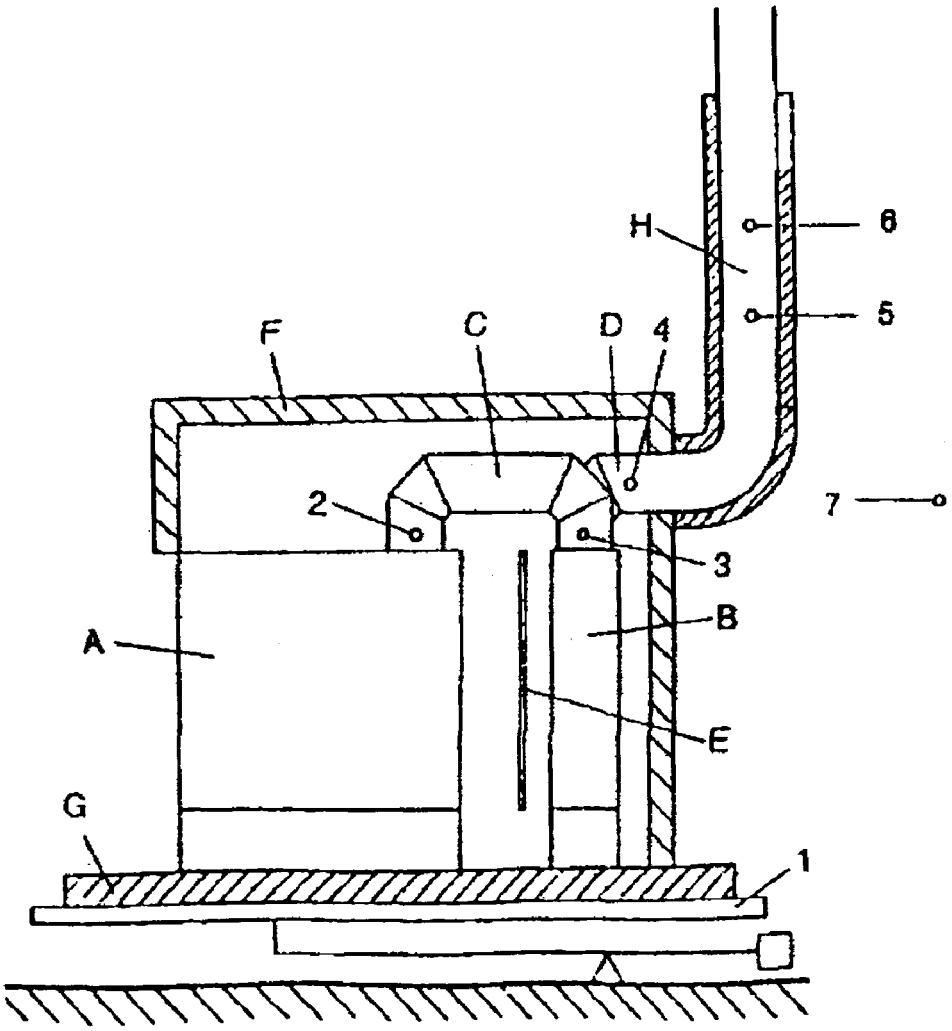


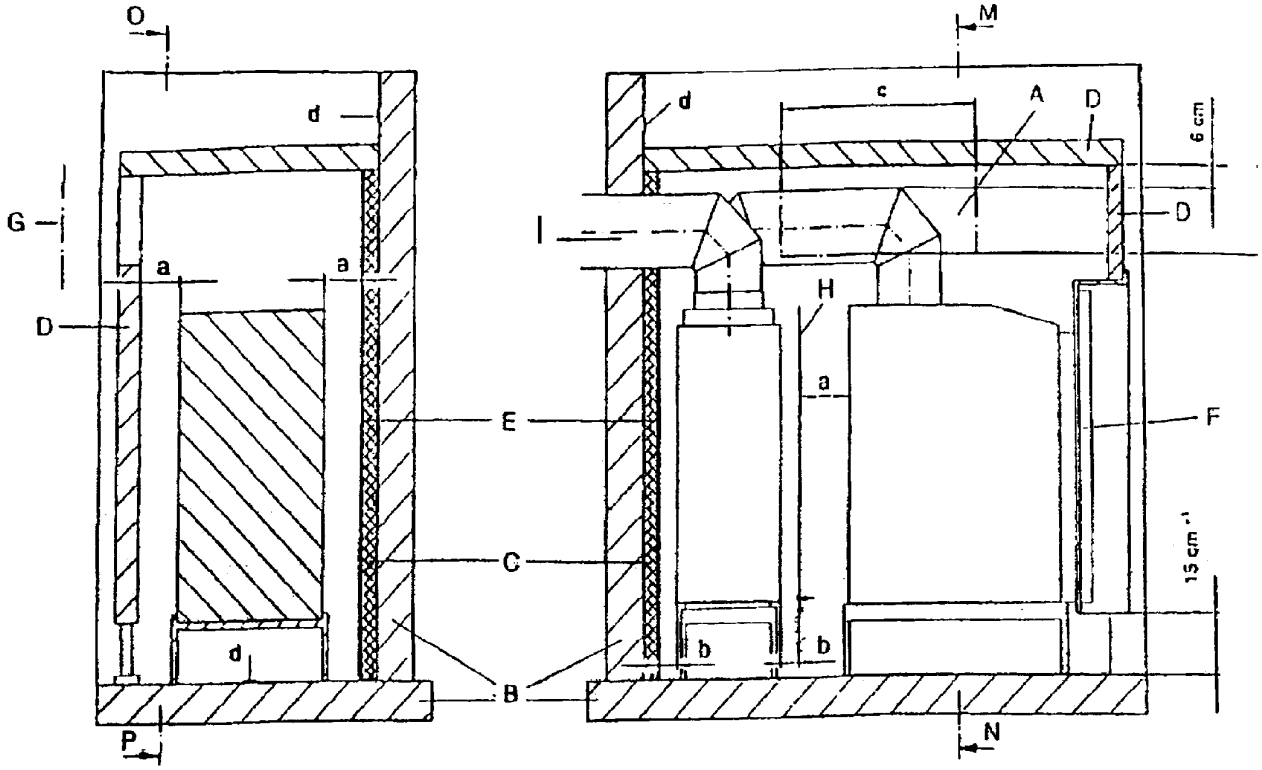
Figure A.12 - Dimensions of measurement section for natural draught safety test



Key

A	Heat generator
B	Heat exchanger
C	Flue gas pipe
D	Flue gas connector
E	Radiation protection
F	Test surround
G	Test hearth
H	Measurement section
1	Platform scale
2	Measurement of temperature at heat generator outlet
3	Measurement of temperature at the exchanger inlet
4	Measurement of temperature at exchanger outlet
5	Measurement of flue gas temperature and constituents
6	Static pressure measurement
7	Measurement of the ambient temperature

Figure A.13 – Test assembly of Kachelöfen or Putzöfen inset appliances for heating tests



Cross section M N

Cross section O P

Key

A Unlockable open air grille (c variable)
B Test hearth or test wall
C Thermal insulation
D Test room wall, tile simulation: $\lambda = (0{,}8 + 0{,}1)$ W/m K at 400 °C
E Black radiation protection
F Recess frame
G Level of measurement for the temperature at convection air grilles outlet in the central flow
H Radiation protection
I to the measurement section

Minimum distances:

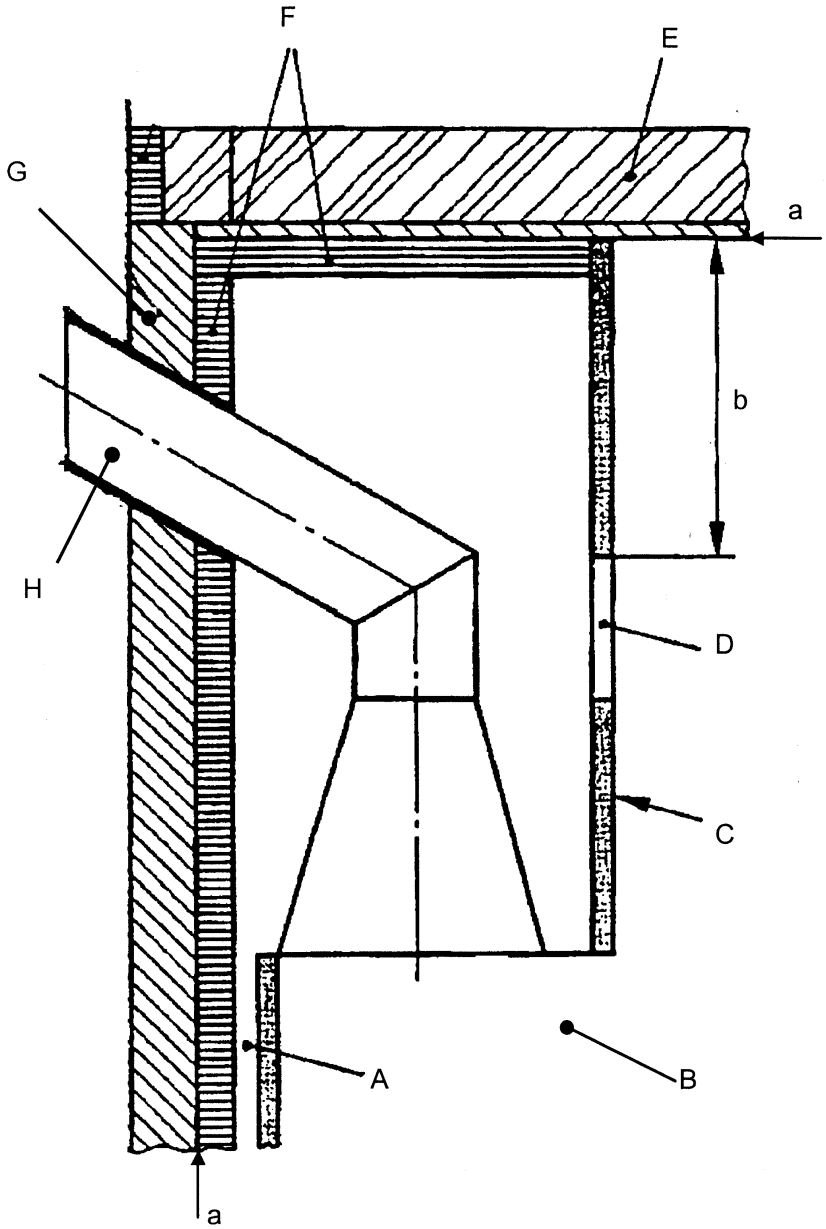
a) between inset and wall of the surround of radiation protection: according to the technical rules or manufacturer's instructions

b) between heat exchanger and radiation protection or thermal insulation according to the technical rules or manufacture's instructions

c) variable width of convection air grille

d) level of measurement

Figure A.14 – Test surround for Kachelöfen or Putzöfen inset appliances



Key

A	Convection air space around appliance
B	Appliance
C	Surround
D	Air grilles
E	Ceiling
F	Insulation
G	Trihedron wall
H	Connection to measurement section
a	Temperature measurement positions
b	Distance from combustible material specified by manufacturer

Figure A.15 – Example of installation with trihedron test wall and ceiling

Annex B
(normative)
Test fuels and recommended fuels

B.1 General

The standardised test fuels with 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 he recommends for use on the appliance. For reference purposes Table B.2 gives a list of the types of currently available commercial fuels against each test fuel type as well as detailing their typical characteristics. The test for suitability of a recommended fuel are described in B.3.

B.2 Test fuel

B.2.1 Selection of test fuel

Based upon the number of types of commercial fuels recommended by the appliance manufacturer in the operating instructions, the test laboratory shall select from Table B.1 the appropriate test fuel corresponding to each of those recommended commercial fuel types. The size grading of the test fuel shall be in accordance with that specified by the appliance manufacturer in his operating instructions.

B.2.2 Storage, preparation and analysis

Each batch of test fuel shall be stored under cover and prior to use solid mineral fuels shall be sieved to ensure that the proportions of oversize and undersize material present are each no greater than 5 % by mass.

When sampled and analysed in accordance with the appropriate ISO test method specified in Tables B.1 and B.2, each batch of test fuel shall conform to the appropriate specification 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.

It is the responsibility of the test laboratory to ensure that the properties of the test fuel used meet the appropriate test fuel specifications as given in Table B.1.

NOTE The analysis may be guaranteed by a supplier’s certificate of analysis.

The analysis and specification for the test fuel(s) used shall be given in the test report on the appliance performance.

B.3 Tests for recommended fuels

B.3.1 Basis of testing

The testing of a recommended fuel shall be carried out using a standard appliance previously type tested and chosen by the test laboratory to be representative of its appliance class and type. The chosen appliance shall be installed in accordance with the installation methods given A.4 of this standard as appropriate to its class and type and using the test and measuring equipment described in A.1 to A.3 of this standard.

The degree of testing to be undertaken depends on whether or not the fuel lies within the commercial fuel specification of Table B.2 and is considered to be properly represented by a test fuel from Table B1. The process of selecting the tests to be carried out shall be as shown diagramatically in Figure B.1 and the methods and criteria for the tests shall be as described in B.3.2.

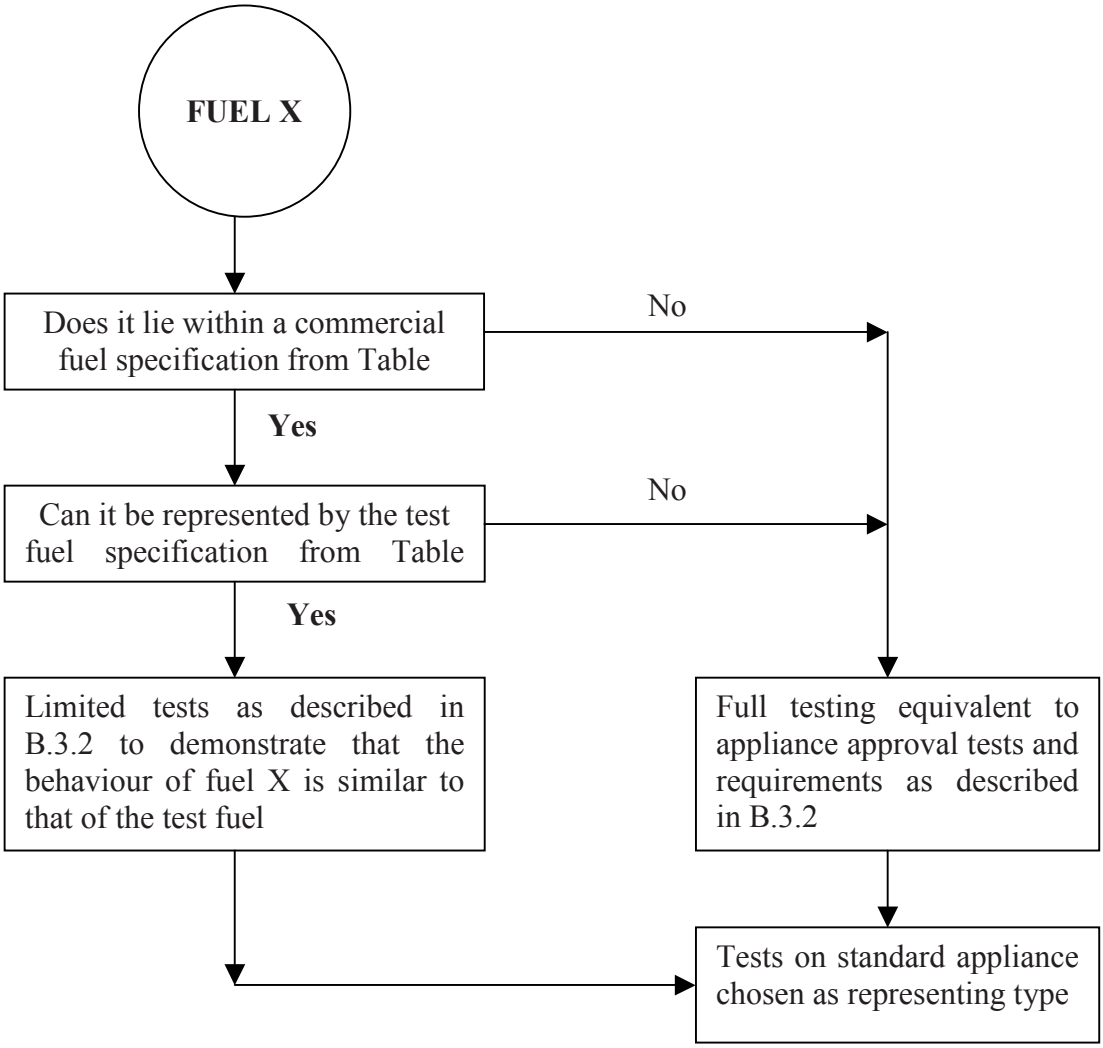


Figure B.1 - Flow chart showing selection process for tests on recommended fuels

B.3.2 Test methods and criteria

A2 Where a recommended commercial fuel is technically represented by a test fuel in Table B.1 and its analysis lies within the analysis range of the commercial fuel types given in Table B.2 then it shall be subjected to limited testing in accordance with the test methods for nominal heat output and slow combustion given in A.4.7 and A.4.8 respectively of this standard as appropriate for that appliance class and type. The limited tests to be performed and the criteria to be met shall be as follows:

1) nominal heat output test in accordance with A.4.7:

   - nominal heat output to be not less than 95 % of that claimed by the appliance manufacturer and confirmed in the test using the test fuel(s);

   - total efficiency to be not less than the minimum efficiency claimed by the appliance manufacturer for the test fuel as detailed in 6.4.2;

   - test duration to be not less than 95 % of the duration given in 6.1;

   - CO emission not to exceed the value declared by the appliance manufacturer for the test fuel as detailed in 6.3;

   - the temperature requirements concerning clearances from combustible materials detailed in 5.2 shall be satisfied. A2

2) slow combustion or reduced combustion and recovery test in accordance with A.4.8:

   - test duration to be not less than the minimum duration given in Table 11 or that greater duration declared by the appliance manufacturer;

   - it shall be possible to recover the fire after the slow combustion or reduced combustion test period.

Where a new commercially available fuel is not technically represented by a test fuel type listed in Table B.1 or its analyses lies outside the analyses range of the commercial fuel types given in Table B.2 or its nature and characteristics are such that its performance cannot be predicted from the information or analyses provided then the fuel shall be fully tested. The fuel shall be tested on a standard previously type tested appliance (or appliances) chosen to be representative of the class and/or type of appliance on which the fuel will be burned to ensure the safety requirements detailed in 5.2, 5.3 and 5.6, and the performance requirements detailed in 6.2 to 6.9 are met.

NOTE Where appropriate, the performance testing of a recommended fuel as being suitable for use on a particular appliance type may be undertaken by the appliance manufacturer, the fuel producer or by an independent testing laboratory.

Table B.1 - Test fuel specifications

Commercial fuel types	Anthracite Dry steam coal	Hard Coke	Low Temp Coke	Briquetted fuel for closed appliances	Briquetted fuel for open fires	Bituminous coal	Lignite briquettes	Peat briquettes	Wood logs
Test fuel Designation	A	B	C	D	E	F	G	H	Beech, birch or hornbeam
Moisture content (as fired basis) ISO 331:1983 and ISO 687:1974	< 5 %	< 5 %	< 5 %	< 5 %	< 5 %	(8 ± 2,5) %	(18,5 ± 2) %	(11 ± 2) %	(16 ± 4) %
Ash content (as fired basis) ISO 1171:1997	(5 ± 2) %	(7 ± 2) %	(7 ± 2) %	(8 ± 3) %	(5 ± 2) %	(6 ± 2) %	< 6 %	< 4 %	< 1 %
Volatile matter (dry, ash-free basis) ISO 562:1998	< 14 %	< 2 %	(8 ± 2) %	< 13 %	< 18 %	> 30 %	< 55 %	(68 ± 3) %	(84 ± 4) %
Hydrogen content (as fired basis) ISO 609:1996	(4 ± 1) %	< 0,5 %	< 3 %	< 4 %	< 4 %	(4 ± 1) %	≤ 4 %	(5,2 ± 0,7) %	(5 ± 1) %
Carbon content (as fired basis) ISO 609:1996	(82 ± 5) %	(90 ± 5) %	(78 ± 3) %	(82 ± 5) %	(80 ± 5) %	(72 ± 5) %	(50 - 55) %	(48,5 ± 4,5) %	(40 ± 5) %
Sulfur content (as fired basis) ISO 351:1996 and ISO 334:1992	< 1 %	< 1,4 %	< 2 %	< 1,8 %	< 1,8 %	≤ 2 %	≤ 1 %	< 0,3 %	< 0,1 %
Net (lower) calorific value (as fired basis) ISO 1928:1995	> 28 980 kJ/kg	> 26 630 kJ/kg	> 28 500 kJ/kg	> 29 690 kJ/kg	> 29 690 kJ/kg	> 26 500 kJ/kg	≤ 21 000 kJ/kg	> 17 000 kJ/kg	$H_{uw} = (H_{uwf}(100-w)-2,44w) / 100$
Size, length	commercial size in accordance with manufacturer's instructions *								
Swelling index ISO 501:1981						according to manufacturer's instructions			

- A maximum of 5 % oversize and undersize only is permissible in the test fuel.

NOTE Some countries have national regulations on the type and quality (e.g. sulfur content) of fuels which have to be complied with in those countries.

Table B.2 - Typical commercial fuel specifications

Commercial fuel types	Anthracite Dry steam coal	Hard coke	Low temp coke	Briquetted fuel for closed appliances	Briquetted fuel for open fires	Bituminous coal	Lignite briquettes	Peat briquettes	Wood logs	Compressed, untreated wood
Moisture content (as fired basis) ISO 331:1983 and ISO 687:1974	3 % to 6 %	1 % to 16 %	1 % to 16 %	< 14 %	< 14 %	3 % to 12 %	15 % to 22 %	9 % to 14 %	12 % to 25 %	< 12 %
Ash content (as fired basis) ISO 1171:1997	3 % to 14 %	4 % to 15 %	4 % to 10 %	4 % to 12 %	3 % to 8 %	2 % to 8 %	1 % to 12 %	< 6 %	< 1,5 %	< 1,5 %
Volatile matter (dry, ash-free basis) ISO 562:1998	3 % to 14 %	< 2,0 %	6 % to 12 %	5 % to 17 %	10 % to 18 %	20 % to 45 %	51 % to 62 %	63 % to 73 %	80 % to 88 %	80 % to 88 %
Hydrogen content (as fired basis) ISO 609:1996	2 % to 5 %	< 0,5 %	< 3 %	2 % to 4 %	2 % to 4 %	4 % to 5 %	3 % to 4 %	4,5 % to 5,8 %	4 % to 7 %	5,0 % to 6,5 %
Carbon content (as fired basis) ISO 609:1996	80 % to 90 %	75 % to 95 %	75 % to 85 %	70 % to 90 %	65 % to 85 %	50 % to 80 %	50 % to 55 %	44 % to 53 %	35 % to 45 %	40 % to 50 %
Sulfur content (as fired basis) ISO 351:1996 and ISO 334:1992	< 1,8 %	< 1,8 %	< 1,8 %	< 1,8 %	< 1,8 %	0,8 % to 2,1 %	0,2 % to 3,5 %	< 0,3	< 0,1 %	< 0,1 %
Net (lower) calorific value (as fired basis) ISO 1928:1995	29 310 kJ/kg to 33 000 kJ/kg	25 100 kJ/kg to 29 000 kJ/kg	26 000 kJ/kg - to 30 000 kJ/kg	27 000 kJ/kg to 32 300 kJ/kg	26 000 kJ/kg to 32 000 kJ/kg	22 500 kJ/kg to 31 000 kJ/kg	18 000 kJ/kg to 21 000 kJ/kg	16 800 kJ/kg to 19 300 kJ/kg	17 000 kJ/kg to 20 000 kJ/kg	17 500 – 19 500 kJ/kg
Size, length	3 mm to 80 mm	9,5 mm to 90 mm	10 mm to 80 mm	20 g to 140 g	20 g to 140 g	75 mm to 130 mm	50 mm to 100 mm or 155 mm to 182 mm	briquettes, nuggets		
Swelling index ISO 501:1981						0 to 9				
Length									⟩A2⟨ 0,2 m to 1,0 m ⟩A2⟨	
Designation of standard test fuel to be used	A	B	C	D	E	F	G	H	Beech, birch or hornbeam	Beech, birch or hornbeam wood logs

NOTE Some countries have national regulations on the type and quality (e.g. sulfur content) of fuels which have to be complied with in those countries.

Annex C deleted

A2

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 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 the inset appliances including open fires fired by solid fuels covered by this annex for the 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 uses, can be applicable to the Inset appliances including open fires fired by solid fuels 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 (accessed through http://europa.eu.int/comm/enterprise/construction/internal/dangsub/dangmain.htm).

This annex establishes the conditions for the CE marking of the inset appliances including open fires fired by solid fuels 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. A2

A2

Table ZA.1 – Relevant clauses for Inset appliances

Product: Inset appliances including open fires fired by solid fuel as covered under the scope of this standard **Intended use:** Space heating in residential buildings with possible supply of hot water			
Essential Characteristics	**Requirement clauses in this and other European Standard(s)**	**Levels and/or classes**	**Notes**
Fire safety	4.2, 4.3, 4.7, 4.8, 4.10, 4.11, 4.15, 5.2, 5.5, 5.6, 5.9, 5.10, 6.11	-	
Emission of combustion products	4.2, 4.3, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10, 4.12, 4.14, 4.15, 5.1, 5.4, 5.5, 6.2, 6.3	-	Test result for CO emission with threshold value < 1,0 %
Release of dangerous substance	ZA.1	-	
Surface temperature	4.2, 4.13, 5.2, 5.3, 5.6, 5.10	-	
Electrical safety	5.9	-	
Maximum operating pressure (applicable only where the appliance is fitted with a boiler)	4.2, 5.7, 5.8	- -	
Mechanical resistance (to carry a chimney/flue)	4.2, 4.3	-	
Thermal output/Energy efficiency	6.1, 6.4 to 6.10, 6.12	-	Test result for efficiency with threshold value of > 75 % for Kachelöfen or Putzöfen inset appliances or ≥ 30 % for all other appliance types

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 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. A2

ZA.2 Procedure for attestation of conformity of Inset appliances including open fires fired by solid fuel

ZA.2.1 System of attestation of conformity

The system of attestation of conformity of Inset appliances including open fires fired by solid fuel indicated in Table ZA.1, in accordance with the Decision of the Commission 1999/471/EC of 1999-06-29 as given in Annex III of the mandate for "Space heating appliances", is shown in Table ZA.2 for the indicated intended use and relevant level(s) or class(es):

Table ZA.2 – System of attestation of conformity

Product(s)	Intended use	Level(s) or class(es)	Attestation of conformity system
Inset appliances including open fires fired by solid fuel	Space heating in residential buildings with possible supply of hot water	-	3
System 3: See Directive 89/106/EEC (CPD) Annex III.2.(ii), Second possibility.			

The attestation of conformity of the Inset appliances including open fires fired by solid fuel in Table ZA.1 shall be based on the evaluation of conformity procedures indicated in Table ZA.3 resulting from application of the clauses of this or other European Standard indicated therein.

Table ZA.3 – Assignment of evaluation of conformity tasks for Space heating in residential buildings with possible supply of hot water under system 3

Tasks		Content of the task	Evaluation of conformity clauses to apply
Tasks for the manufacturer	Factory production control (F.P.C)	Parameters related to all relevant characteristics of Table ZA.1	9.3
	Initial type testing	All relevant characteristics of Table ZA.1 not tested by the notified body i.e. those shown below	9.2
Tasks for the notified test laboratory	Initial type testing	Fire safety Emission of combustion products Surface temperature Thermal output/Energy efficiency Release of dangerous substances	9.2

A2

ZA.2.2 EC Certificate and 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 (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;
- description of the product (type, identification, use,...), and a copy of the information accompanying the CE marking;
- 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 and certificate shall be presented in the official language or languages of the Member State in which the product is to be used.

ZA.3 CE marking and labelling

The manufacturer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE marking symbol to affix shall be in accordance with Directive 93/68/EC and shall be shown on the Inset appliances including open fires fired by solid fuel (or when not possible it may be on the accompanying label, the packaging or on the accompanying commercial documents e.g. a delivery note). The following information shall accompany the CE marking symbol:

- name or identifying mark and registered address of the producer;
- the last two digits of the year in which the marking is affixed;
- number of the EC Certificate of conformity or factory production control certificate (if relevant);
- reference to this European Standard; (EN 13229:2001 and A2:2004)
- description of the product: generic name, material, dimensions, … and intended use;
- information on those relevant essential characteristics listed in Table ZA.1 which are to be declared presented as:
  - declared values and, where relevant, level or class (including “pass” for pass/fail requirements, where necessary) to declare for each essential characteristic as indicated in “Notes” in Table ZA.1;
  - “No performance determined” for characteristics where this is relevant;
  - as an alternative, a standard designation which shows some or all of the relevant characteristics (where the designation covers only some characteristics, it will need to be supplemented with declared values for other characteristics as above. A2

A2
In particular the following information shall be given:

- the recommended fuel type (or types)
- distance to adjacent combustible materials
- emission of CO in combustion products (Test result value but < 1,0 %)
- maximum operating pressure (where relevant)
- flue gas temperature
- thermal output
- energy efficiency (Test result value but > 75 % for Kachelöfen or Putzöfen inset appliances or ≥ 30 % for all other appliance types)

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 the information to be given on the product, label, packaging and/or commercial documents. A2

A2

CE	*CE conformity marking, consisting of the "CE"-symbol given in Directive 93/68/EEC.*
AnyCo Ltd, PO Box 21, B-1050 **03**	*Name or identifying mark and registered address of the producer* *Last two digits of the year in which the marking was affixed*
EN 13229:2001 and A1:2003 Open fire inset burning solid fuel with back boiler **Distance to adjacent combustible materials** : 140 cm minimum **Emission of CO in combustion products** : 0,3 % **Maximum operating pressure** : 1,9 bar **Flue gas temperature** : 300 °C **Thermal output** : 2,5 kW space heating output with 7,7 kW water heating output **Energy efficiency** : 65 % **Fuel types** : Briquetted open fire fuels, low temperature cokes and bituminous coals	*No. of European Standard* *Description of product and information on regulated characteristics*

Figure ZA.1 – Example CE marking information

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 European legislation without national derogations need not be mentioned.

A2

Bibliography

EN ISO 9001 *Quality management systems — Requirements (ISO 9001:2000).*

blank

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: +44 (0)20 8996 9000. Fax: +44 (0)20 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: +44 (0)20 8996 9001. Fax: +44 (0)20 8996 7001. Email: orders@bsi-global.com. Standards are also available from the BSI website at http://www.bsi-global.com.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: +44 (0)20 8996 7111. Fax: +44 (0)20 8996 7048. Email: info@bsi-global.com.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: +44 (0)20 8996 7002. Fax: +44 (0)20 8996 7001. Email: membership@bsi-global.com.

Information regarding online access to British Standards via British Standards Online can be found at http://www.bsi-global.com/bsonline.

Further information about BSI is available on the BSI website at http://www.bsi-global.com.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL