

Flued oil stoves with vaporizing burners

The European Standard EN 1:1998, incorporating amendment A1:2007,
has the status of a British Standard

ICS 91.140.20

Confirmed March 2008

National foreword

This British Standard is the official UK version of EN 1:1998, incorporating amendment A1:2007.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**. 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 UK participation in its preparation was entrusted to Technical Committee RHE/13, Oil burning equipment.

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.

This British Standard, having been prepared under the direction of the Engineering Sector Board, was published under the authority of the Standards Board and comes into effect on 15 September 1998

© BSI 2007

Amendments issued since publication

Amd. No.	Date	Text affected
17134	29 June 2007	See national foreword

ISBN 978 0 580 59195 2

ICS 91.140.20

Descriptors: Heaters, liquid fuel appliances, oil stoves, oil burners, combustion product discharge, definitions, equipment specifications, performance evaluation, measurements, name plates, technical notices, marking

English version

Flued oil stoves with vaporizing burners

Poêles à combustible liquide avec brûleurs à
vaporisation raccordés à un conduit d'évacuation
des produits de la combustion

Heizöfen für flüssige Brennstoffe mit
Verdampfungsbrennern und Schornsteinanschluß

This European Standard was approved by CEN on 26 February 1998.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

© 1998 CEN All rights of exploitation in any form and by any means reserved worldwide for CEN national Members.

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 46, Oil stoves, the secretariat of which is held by DIN.

This European Standard replaces EN 1:1980.

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 November 1998, and conflicting national standards shall be withdrawn at the latest by November 1998.

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 1:1998/A1:2007) has been prepared by Technical Committee CEN/TC 46 “Oil stoves”, the secretariat of which is held by DIN.

This Amendment to the European Standard EN 1:1998 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2007, and conflicting national standards shall be withdrawn at the latest by January 2009.

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 Directive(s).

For relationship with EU Directive(s), 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, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Contents

	Page
Foreword	2
Introduction	3
1 Scope	3
2 Normative references	3
3 Definitions	3
4 Constructional requirements	4
5 Performance and operating requirements	6
6 Tests	8
7 Instructions and marking of the appliance	14
8 Evaluation of conformity	15
Annex A (normative) Measuring methods for determining the smoke number	18
Annex B (normative) Fluid method for detecting oil derivatives	18
Annex C (normative) Measurement of nitrogen oxides	30
Annex D (normative) Measurement of total hydrocarbons (THC)	32
Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 89/1065/EC, EU Construction Products Directive	33
Bibliography	37

Introduction

This standard specifies the constructional and operating requirements, conditions for functional testing, and marking and instructions for flued oil stoves with vaporizing burners.

1 Scope

[A1] This standard applies to flued oil stoves with one or more vaporizing burners (hereafter referred to as “stoves”) as used for individual heating in the domestic field and having either a draught regulator or a combustion air limiter as defined in **3.13** and a nominal heating capacity of not more than 15 kW.

This standard also applies to appliances with fan assisted vaporizing burners.

This standard does not cover

- built-in appliances
- appliances equipped with an atomizing burner
- appliances incorporating a boiler or connected to a water system

According to the type of fuels used in the country of destination, the stoves are supplied for use with either:

- fuel oil with a maximum kinematic viscosity of 6,0 mm²/s at 20 °C
- or kerosene with a flash point of not less than 40 °C **[A1]**

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 referred to applies.

EN 50165, *Electrical equipment of non-electric appliances for household and similar purposes — Safety requirements*.

[A1] EN 60335-2-102:2006 *Household and similar electrical appliances – Safety – Part 2-102: Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections (IEC 60335-2-102:2004, modified)*

ISO 2859 (all parts) *Sampling procedures for inspection by attributes* **[A1]**

3 Definitions

For the purposes of this standard, the following definitions apply:

3.1

flue gas

flue gas is the product of combustion leaving the stove by means of the flue gas outlet

3.2

flue gas mass flow

flue gas mass flow is the mass of flue gas being evacuated over a given period of time

3.3

steady operating condition of the stove

steady operating condition of the stove the operating condition of the stove corresponding to a given heat input in which the flue gas temperature in the measuring sleeve (see Figure B.3) does not vary by more than 5 K over a period of 15 min.

3.4

control device

the control device is a component of the oil regulator for adjusting the oil flow from a closed to a maximum open position

3.5

maximum oil flow position

the maximum oil flow position is the control device setting with the maximum oil flow to the burner

3.6

heating gases

heating gases are the combustion gases flowing inside the stove

3.7

minimum oil flow position

the minimum oil flow position is the control device setting with the minimum oil flow to the burner

3.8

nominal heating capacity

the nominal heating capacity is the heating capacity indicated on the rating plate

3.9

storage tank

the storage tank is the part in the stove from which the burner is supplied with fuel

3.10

oil derivatives

oil derivatives are the organic substances which are deposited onto the filter paper when determining the smoke number

3.11

oil regulator

the oil regulator is a device which ensures an adjustable, constant flow of oil to the burner

3.12

smoke number

smoke number (SN) is the degree of blackening which the soot causes on white filter paper under the conditions specified in this standard

3.13

combustion air limiter

the combustion air limiter is a device for limiting the combustion air supply

3.14

combustion air conveyor

the combustion air conveyor is a device for conveying the combustion air supply

3.15

combustion chamber

the combustion chamber is the area in the stove where combustion takes place

3.16

vaporizing burner

the vaporizing burner is a burner in which combustion of the fuel occurs under the effect of heat and, together with the combustion air, forms a combustible fuel vapour/air mixture

3.17

heat input

the amount of heat supplied by the fuel on an hourly basis to the stove, calculated using the calorific value, H_i of the fuel

3.18

heating capacity

the heating capacity is the useful amount of heat given off hourly by the stove

3.19

efficiency

efficiency is the ratio of the actual heating capacity to the related heat input, expressed as a percentage

3.20

ignition device

the ignition device is a built-in device for igniting the fuel vapour/air mixture

3.21

content of NO_x

content of NO_x in the dry flue gases measured as volume in ppm, calculated as NO_2 , expressed in mg/MJ $\triangleleft A1$

3.22

content of unburnt hydrocarbons

content of unburnt hydrocarbons in the dry flue gases measured as volume in ppm, calculated as C_3H_8 , expressed in mg/MJ $\triangleleft A1$

4 Constructional requirements

4.1 Heating capacity

The nominal heating capacity, expressed in kilowatts, shall be:

- selected by the manufacturer;
- verified during the tests;
- indicated on the rating plate.

The nominal heating capacity shall be rounded off to the nearest multiple of 500 W.

4.2 Materials

The quality of the materials as well as the shape and dimensions of the components shall ensure that, provided the operational procedures are met and with the associated mechanical, chemical and thermal stresses which occur, the stoves will remain safe and operable over a given period.

$\triangleleft A1$ The stove shall be fire-resistant and safe to operate, and shall be designed such that

- no visible deformations following the performance tests according to Clause 6 occur;
- it can withstand the stresses arising during normal operation;
- the burner and the stove cannot become heated to create a hazard;
- dangerous accumulations of combustible gases (fuel mixed with air) in the combustion chamber and in the flues are prevented (for automatically operated burners only);
- gases cannot leak from the stove in dangerous quantities.

The stove shall be made of non-combustible materials except that combustible materials shall be allowed for the following:

- components of accessories e.g. burner covers, if the parts are fitted outside of the boiler;
- internal components of controls and safety equipment;
- operating handles;
- electrical equipment.

Component parts of covers, operating, control and safety devices and electrical accessories shall be arranged in such a way that their surface temperatures, under steady state conditions, do not exceed those specified either by the manufacturer or in the component part standard. $\triangleleft A1$

[A1] NOTE Because the entire heat dissipating surfaces of the appliance including the flue spigot/socket and the flue gas connector are working surfaces, there is no requirement for limiting the surface temperature of the appliance. **[A1]**

4.3 Combustion chamber

The combustion chamber shall be properly sealed and fitted with a device (e.g. lid, door, etc.) which cannot be locked, and designed to compensate for any excess pressure.

4.4 Filter

The stove shall include at least one filter situated either before or inside the oil regulator and a strainer in the filling orifice. The filter shall retain particles with a diameter of over 0,25 mm. The filter and strainer shall be easy to remove and clean.

4.5 Oil regulator

Oil regulators, or equivalent devices, shall maintain the flow of oil reaching the burner at a constant value corresponding to the setting selected.

The closed and maximum open positions shall each have a limiting stop.

The minimum position shall be clearly marked and be sensed as a resistance that can be overcome mechanically.

4.6 Marking of operating settings

The control device for the oil regulator shall have clearly visible and permanent markings.

4.7 Safety device

The stove shall have a safety device to prevent overflowing of the oil from the burner.

4.8 Fan for the supply of combustion air

Irrespective of the operating setting of the stove, the supply of combustion air from the fan shall not create excess pressure in the combustion chamber. The operation of the fan shall be trouble free.

The function of the burner shall be linked with that of the fan. In the event of a failure of the fan, the flow of oil to the burner shall be either totally interrupted or reduced to a flow such that the smoke number does not exceed the maximum permissible value for the operation of the burner without the fan.

If the fuel supply to the burner is completely cut off by an electric current failure, then for manually operated burners (without automatic ignition), when the current is restored, the fuel shall be readmitted to the burner manually. For automatically operated burners (automatic ignition), when the current is restored, the ignition without a blow-out shall be ensured.

4.9 Fuel lines

The fuel lines shall not be load-bearing parts of the construction.

The fuel lines shall be resistant to the fuel and shall not exceed the maximum permissible surface temperatures specified by the manufacturer.

Removable fuel lines shall be connected by means of metal screw threads including at least four engaged threads.

The sealing of the parts containing fuel shall be such that there is no leakage or seepage.

[A1] It shall not be possible to remove any component in the oil supply line to the burner without the use of a tool. **[A1]**

4.10 Storage tank

When the stove includes a storage tank, its effective capacity shall enable operation of the stove for:

- at least 10 h in the case of nominal heating capacity ≤ 8 kW; and
- at least 8 h in the case of a nominal heating capacity > 8 kW.

The filling orifice of the storage tank shall have a cap.

It shall be possible to cut off the supply of fuel from the storage tank to the burner by means of a shut-off device fitted before the oil regulator. If it is a rotary device, closing shall be by turning in a clockwise direction.

[A1] To ensure that any fire external to the stove is not transmitted to the contents of the built-in storage tank or, if a fire does occur, its effects are limited by either the tank being made of non-combustible materials e.g. metal or be enclosed with non-combustible fire resisting materials or construction. Any fuel lines from the tank to the burner shall also be fire resistant.

The filling orifice of the built-in storage tank shall have a cap and shall be easily accessible and it shall be so arranged that when filling the tank with fuel it is not possible to ignite the fuel from any hot components. **[A1]**

4.11 Oil-level indicator

Built-in storage tanks shall have an oil-level indicator.

4.12 Drip tray

[A1] Any stove incorporating a built-in storage tank shall incorporate a drip tray, below the parts of the stove containing fuel, for the collection of any spillage, having an edge height of at least 10 mm (inside depth) and capacity of at least 1 dm³. **[A1]**

4.13 Flue outlet

The flue outlet can be of the push-on or push-in type and shall have a circular cross-section at its end and permit the attachment of a flue gas pipe, the diameter of which complies with the applicable standards of the country in which the stove is to be installed.

It shall be possible to fit a flue pipe, having a diameter D in a length $D/4$, but at least 30 mm, onto or into the flue outlet.

4.14 Damper

Dampers or other movable devices for restricting the flow of flue gases are not permitted.

4.15 Draught regulators and combustion air limiters

Draught regulators shall be able to be set in a permanent manner at the maximum draught indicated by the manufacturer. This value shall be given in the installation instructions.

Draught regulators and combustion air limiters built into the stove shall be fitted at the manufacturer's works and shall operate automatically.

One of these two devices shall be fitted if the stove has no fan for the supply of combustion air.

4.16 Assembly

The stove shall be supplied by the manufacturer with all parts assembled; the flue outlets and burner rings may be built in subsequently. Non-removable parts shall be securely fitted in their position of use. For removable parts, see 7.2.

4.17 Maintenance

Parts which are removable to allow for maintenance and cleaning shall be readily accessible and designed so that they can be correctly reassembled in accordance with the manufacturer's instructions.

A1 4.18 Additional requirements for appliances with automatic burners

The burner and control system in combination shall be such that, in the event of failure to ignite when starting, the burner will assume a safe condition (lock-out) and will require a manual reset of its sequencing control. In the event of a flame failure occurring when running, the appliance shall fail safe.

A temperature or pressure sensing device shall be provided on the appliance to start and stop the burner. In addition, a separately operating limiting device shall be provided to stop the burner before the temperature in the appliance exceeds safe limits. **A1**

A1 Controls and safety devices shall be coupled so that operation of each occurs in the correct sequence and timing; coupling may be electrical or mechanical. The controls and safety devices shall:

- a) ensure that the start-up sequence is not able to commence unless the flame sensing equipment has confirmed the no-flame condition;
- b) establish satisfactory ignition of the oil;
- c) maintain normal operation if the flame is satisfactorily established, and switch off ignitor;
- d) automatically vary the burner firing rate, where applicable;
- e) stop the burner when the demand for heat is satisfied;
- f) stop the oil supply and lock-out system if flame is not satisfactorily established;
- g) provide means for a visible or audible indication that the unit is in a lock-out condition;
- h) ensure that any interruption of the electricity supply does not give rise to a dangerous condition.

If the control sequences are such that an attempt to re-ignite the burner can be made the burner shall either:

- i. ignite and burn in a safe manner whilst the surplus oil is burnt off and the burner is returning to normal operation conditions; or
- ii. not ignite.

Manually operated dampers or other movable devices for restricting the flow of gases shall not be fitted. Automatically operated dampers, if fitted, shall be interlocked with the fuel supply and arranged so that the burner cannot operate with a closed flue. **A1**

A1 5 Performance and operating requirements **A1**

Under the test conditions given in clause 6, the following requirements shall be met.

5.1 Maximum oil flow

With the control device in the maximum position, the heating capacity shall be equal to, or greater than, the nominal heating capacity.

5.2 Minimum oil flow

With the control device in the minimum position, the average hourly oil flow shall not exceed one-third of the nominal flow at nominal heating capacity. Stoves having a maximum flow of 0,200 kg/h in the minimum setting are excluded from this requirement.

If the control device of oil-fired heating appliances is reduced by hand, the maximal rate shall not be more than 50 % of the oil rate per hour at nominal heat input.

5.3 Ignition

It shall be possible easily to light the burner from cold following the manufacturer's operating instructions.

A1 5.4 Appliance classes for efficiency and emissions

The requirements of Table 1 shall be fulfilled as appropriate to the appliance class.

A1 5.7 CO in the flue gases **A1**

The emission of carbon monoxide (CO) in the flue gases, of an amount of fuel corresponding to 1 MJ (based on H_i), shall not exceed the value of 0,4 g/MJ at all rates of operation.

This value shall be calculated as the mean value from the tests as described in 6.5.2.1, 6.5.2.2 and 6.5.3.2.

A1 In addition for appliances of class 1 according to Table 1, the content of CO measured at nominal heat output and at low rate shall not exceed 20 mg/MJ. **A1**

Table 1 — Appliance Classes

Appliance Class	CO mg/MJ	C_nH_m mg/MJ	NO _x mg/MJ	Efficiency at nominal heat output %		Smoke number	
				appliances < 4 kW	appliances ≥ 4 kW	Gas oil	Kerosene
1 ^a	20	6	35	78	81	1	1
2 ^b	400	—	—	75	75	2	2
3 ^b	400	—	—	75	75	3	2
4 ^b	400	—	—	70	70	3	2
5 ^b	400	—	—	60	60	—	—

^a measured at nominal heat output and low rate only
^b measured in the whole heat output range

NOTE 1 National regulations might request the statement of efficiency values as well as the class. Therefore in these cases it is allowed to state the efficiency value in addition on the data plate and/or in the technical information (see 7.4).
 NOTE 2 National regulations might request the statement of efficiency values in addition to these measured at nominal heat output. **A1**

5.5 Smoke number

A1 For appliances of the classes 1, 2 and 3 according to Table 1, in the whole heat output range the smoke number shall not exceed 3 for gas oil and 2 for kerosene. For appliances of class 1 according to Table 1, at nominal heat output and at low rate only the smoke number shall not exceed 1 for both gas oil and kerosene.

The flue gases shall not contain oil rest particles.

Under the test conditions of 6.5.1.2, 6.5.1.4 and 6.5.3.1 for gas oil, the smoke number may be one more. **A1**

5.6 Flue gas temperature

During the tests, the flue gas temperature shall not be less than 90 K, nor more than 350 K, above the ambient temperature.

5.8 Oil temperature

The temperature of the fuel in the built-in storage tank and oil regulator shall not exceed 20 K above ambient temperature for fuel oil, or 15 K above ambient temperature for kerosene.

5.9 Floor temperature

The surface temperatures of the underside of the drip tray, shall not exceed 45 K above ambient temperature when using fuel oil, or 35 K above ambient temperature when using kerosene.

The surface temperatures of the floor shall not exceed 60 K above ambient temperature.

A1 This requirement is not applicable if the manufacturer states that the appliance shall not be installed on combustible floor. **A1**

5.10 Wall temperature

The surface temperatures of the walls, behind and adjacent to the stove, shall not exceed 60 K above ambient temperature at the minimum clearances given by the manufacturer in the installation instructions under the test conditions described in 6.5.

A1 This requirement is not applicable if the manufacturer states that the appliance shall not be installed adjacent to combustible walls. **A1**

5.11 Temperature of the control knobs

The temperatures of the control knobs on their contact surface shall not exceed ambient temperature by more than:

- 35 K for metals;
- 45 K for porcelain;
- 60 K for plastics.

This also applies to other similar materials.

These temperatures may be exceeded if the stove is supplied with an accessory with which it is possible to operate the adjustment devices easily and without the risk of burning. The tests shall be carried out as described in **6.5.2.1**.

A1 5.12 Electrical safety

EN 60335-2-102 shall apply with the following condition:

The tests described in Clause **19** of EN 60335-2-102:2006 shall not apply for safety relevant circuits when the mechanical components ensure that any failure or interruption of the electronic circuits does not affect the safe operation of the appliance.

5.13 NO_x and unburnt hydrocarbons (C_nH_m) in the flue gases

In addition for appliances of class 1 only according to Table 1, measured at nominal heat output and at low rate the content of NO_x must not exceed 35 mg/MJ and the content of unburnt hydrocarbons must not exceed 6 mg/MJ. **A1**

6 Tests

6.1 Test apparatus

6.1.1 General

A1 The stove shall be installed on test apparatus (see Figure B.1) and connected to the test chimney by means of measuring sleeve (see Figures B.2 and B.3). The test floor and walls together with the accessories shall be as shown in figures by B.4a, B.4b and B.4c. **A1**

The measuring equipment shall meet the following requirements:

CO₂ concentration of flue gases

Continuous recording equipment for determining the CO₂ content with a measuring tolerance of max. ±0,2 % by volume.

CO concentration of the flue gases

Continuous recording equipment for determining the CO content with a measuring tolerance of max. ±0,005 % by volume.

Temperature measuring devices

Continuous recording equipment for determining the flue gas temperature with a measuring tolerance of max. ±2,5 K.

Continuous recording equipment for determining the ambient temperature with a measuring tolerance of max. ±0,5 K.

Equipment for measuring the fuel temperature in the storage tank and oil regulator, the temperature of the fuel lines, on the floor, on the underside of the drip tray, the test wall temperatures and the control knobs with a measuring tolerance of ±1 K.

Measurement of the draught

Continuous recording equipment for determining the draught during operation and with a measuring tolerance of max. ±0,5 Pa.

Measurement of the smoke number

Intermittent recording equipment or manually operated device as shown in **Annex A** for recording at least one measured value in a 15 min period.

Measurement of the quantity of fuel supplied

A1 Gravimetric measuring process for determining the quantity of fuel supplied using a weighing tank and scale having a measuring tolerance of ± 10 g and a scale graduation of at least 2 g or an equivalent volumetric measuring process.

Add the following new measurement equipment downstream the measurement equipment for CO in the flue gases:

- NO_x-content in the flue gases

Continuously recording instrument for the measurement of NO_x-content with an inaccuracy of maximal ±5 ppm

- C_nH_m-content in the flue gases

Continuously recording instrument for the measurement of C_nH_m-content with an inaccuracy of maximal ±5 ppm

More information to measurement of nitrogen oxides (NO_x) and total hydrocarbons (C_nH_m) are given in Annexes C and D.

The draught regulator shall be inoperative during the tests. If a locking device is available, this shall be locked during the tests and unlocked, if necessary, when the stove is installed. **A1**

6.1.2 Testing of stoves having several possible outlet connections

If the stove to be tested has several possible outlet connections, the tests described in **6.5.1.1** to **6.5.3.3** shall be carried out on one outlet connection. For each of the other possible outlet connections, the short-term tests as described in **6.5.1** shall be carried out without altering the oil flow in the oil

regulator. For all possible outlet connections, the nominal heating capacity shall be attained and the specifications for operational use as defined in clause 4 shall be complied with.

6.2 Test fuel

The test fuel used in the tests shall have characteristics corresponding to the average fuel available in the country of destination. The fuels used are:

- fuel oil having a viscosity of $(5,0 \pm 0,5)$ mm²/s at 20 °C and a density of $(0,84 \pm 0,02)$ kg/dm³ at 15 °C;
- kerosene satisfying the regulations valid in the country where the stove is to be used.

The test fuel shall be defined by the following dimensions, which are given in the test report:

- Density at 15 °C kg/m³;
- Viscosity at 20 °C mm²/s;
- Carbon content % by mass;
- Hydrogen content % by mass;
- Sulfur content % by mass;
- Calorific value H_i kJ/kg.

6.3 Verification of construction

By visual inspection or, if necessary, during the operational tests, it shall be ascertained whether the requirements given in clause 4 have been met.

6.4 Testing of leak-tightness of the fuel circuit

During the tests, it shall be verified that there is no leakage or seepage of fuel.

6.5 Operational tests

All the tests shall be carried out on a test chimney (see Figures B.2 and B.3) with the secondary air device adjusted as specified in 6.5.1 so that the draught indicated by the manufacturer is attained at maximum oil flow.

Only the test described in 6.5.3.2 may be carried out either on the test chimney or another chimney.

The evacuation of the flue gases from the test room shall be arranged so that the flow and pressure conditions of the test chimney are unaffected.

The test room temperature shall be between 20 °C and 30 °C.

It shall be verified whether the requirements of clause 5 have been met.

The tests are carried out after the stove has been placed in the test device in accordance with the installation instructions. The distance between the test wall and the apparatus wall containing the flue gas evacuation duct shall not exceed 300 mm. The

test side wall shall be located opposite the hottest point of the stove.

6.5.1 Short-term tests

Before the short-term tests are carried out the control device of the oil regulator is adjusted to the maximum oil flow rate position and it is determined whether the required heating capacity has been reached.

Otherwise, the oil supply to the burner shall be corrected by varying the flow at the oil regulator. During the tests, the secondary air device of the test chimney is adjusted so that it is possible to attain the draught indicated by the manufacturer at maximum oil flow.

No further correction of the secondary air device position shall be undertaken during the tests.

With the above setting of the secondary air device being maintained, the control device is adjusted to minimum oil flow rate and it is determined whether the oil flow meets the requirements of 5.2. Otherwise, the oil supply to the burner shall be corrected by varying the flow at the oil regulator.

Modifications of oil rate are not allowed during the tests.

6.5.1.1 Maximum oil flow rate

The control device shall be set at the maximum position.

When steady operating conditions have been reached, the test begins and lasts for a period of 2 h.

The following values shall be measured or determined:

- Draught (d);
- Quantity of fuel supplied (D);
- Smoke number (RZ);
- Oil derivatives (B);
- Flue gas temperature (t_f);
- CO concentration of flue gases (CO);
- CO₂ concentration of flue gases (CO₂);
- Efficiency (η);
- Heating capacity (P);
- CO quantity in flue gas ($\overline{\text{CO}}$).

The mean values for the quantity of fuel supplied (D), efficiency (η) and heating capacity (P) from the two hour test shall be given.

6.5.1.2 Change from the maximum to the minimum oil flow rate

The control device is moved from the maximum position to the minimum position.

Thirty minutes after the change, the following values shall be measured:

- Draught (d);
- Smoke number (RZ);
- Oil derivatives (B).

6.5.1.3 Minimum oil flow rate

The control device remains in the minimum position.

When steady operating conditions have been reached, the test begins and lasts for a period of 2 h.

The following values shall be measured or determined:

- Draught (d);
- Quantity of fuel supplied (D);
- Smoke number (RZ);
- Oil derivatives (B);
- Flue gas temperature (t_f);
- CO concentration of the flue gases (CO);
- CO quantity in flue gas ($\overline{\text{CO}}$).

The mean value for the quantity of fuel supplied form the two hour test shall be given.

6.5.1.4 Change from the minimum to the maximum oil flow rate

The control device is moved from the minimum to the maximum position.

Thirty minutes after the change, the following values shall be measured:

- Draught (d);
- Smoke number (RZ);
- Oil derivatives (B).

6.5.1.5 Maximum oil flow rate (Repeat tests)

The control device remains in the maximum position.

The test begins immediately after the test described in 6.5.1.4 and lasts for a period of 1½ h.

The same values as in 6.5.1.1 shall be measured or determined.

6.5.2 Long-term tests

6.5.2.1 Maximum oil flow rate

The control device is set to the maximum position.

When steady operating conditions have been reached, the stove shall be operated or the control device shall be set so that the nominal heating capacity is maintained.

The test lasts for a period of 6 h.

The following values shall be measured or determined:

- Draught (d);
- Quantity of fuel supplied (D);
- Smoke number (RZ);
- Oil derivatives (B);
- Flue gas temperature (t_f);
- CO concentration of flue gases (CO);
- CO₂ concentration of flue gases (CO₂);
- Efficiency (η);
- Heating capacity (P);
- CO quantity in flue gas ($\overline{\text{CO}}$);
- NO_x -content in the flue gases (for class 1 appliances only);
- C_nH_m-content in the flue gases (for class 1 appliances only). (A₁)

At the end of the sixth hour of the test, the following shall be measured:

- temperature of the fuel in the storage tank and oil regulator;
- temperature of the floor and underside of the drip tray;
- temperature of the test walls behind and adjacent to the stove;
- temperature of the control knobs.

6.5.2.2 Minimum oil flow rate

The control device is placed in the minimum position.

When steady operating conditions have been reached, the stove shall be operated or the control device positioned so that the fuel supplied is less than or equal to $\frac{1}{3}$ of the fuel supply at nominal heating capacity or less than or equal to 0,200 kg/h.

Automatically regulated stoves shall be operated so that the fuel supplied does not exceed 50 % of that at nominal heating capacity.

The test then lasts for a period of 6 h.

The following values shall be measured or determined:

- Draught (d);
- Quantity of fuel supplied (D);
- Smoke number (RZ);
- Oil derivatives (B);
- Flue gas temperature (t_f);
- CO concentration of flue gas (CO);
- CO₂ concentration of flue gas (CO₂);
- CO quantity in flue gas ($\overline{\text{CO}}$);
- NO_x -content in the flue gases (for class 1 appliances only);
- C_nH_m-content in the flue gases (for class 1 appliances only). (A₁)