

**Fireplaces for liquid fuels — Decorative appliances producing a flame using ethanol based or gelatinous fuel**

Feuerstätten für flüssige Brennstoffe — Dekorative Geräte, die unter Verwendung eines Ethanol basierten flüssigen oder gelförmigen Brennstoffes eine Flamme erzeugen

Poêles à combustibles liquides — Appareils à caractère décoratif qui produisent une flamme à l'aide d'un carburant à la base d'éthanol ou un carburant à base d'un combustible de gel

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Foreword.....	4
1 Scope .....	4
2 Normative references .....	4
3 Terms and definition .....	5
4 Construction .....	6
4.1 General.....	6
4.1.1 Materials .....	6
4.2 Stability .....	6
4.2.1 Safety against overthrow .....	6
4.2.2 Safety against loss of fuel by striking against the appliance .....	7
4.2.3 Safety against tilting and sliding .....	9
4.2.4 Appliance with a safety shutdown or rather safety leakage in case of tilting.....	9
4.3 Safety against the leakage of fuel.....	9
4.4 Fuel tank .....	9
4.5 Igniter .....	10
5 Operating method.....	10
5.1 General.....	10
5.2 Test conditions .....	11
5.3 Fuel flow .....	11
5.4 Reliability .....	11
5.5 Combustion performance .....	12
5.6 Fire safety.....	12
5.6.1 General.....	12
5.6.2 Floor temperature .....	12
5.6.3 Partition temperature .....	12
5.6.4 Temperature of the operating handles .....	12
5.6.5 Temperature of touchable surface.....	13
5.6.6 Ignition, expiration of flame, relighting (from warm/cool state) .....	13
5.6.7 Predictable failure.....	14
5.7 Electrical safety .....	14
6 Marking .....	14
6.1 General.....	14
6.2 Type plate .....	14
6.3 Warning plate .....	14
6.4 Marking on the package (to check).....	15
7 Instructions .....	15
7.1 General.....	15
7.2 Installation instruction .....	15
7.3 User operating instructions.....	16
8 Factory owned production control system.....	17
8.1 General.....	17
8.2 Materials and prefabricated parts .....	17
8.3 Control of assay-, measurement and test appliances .....	17
8.4 Process control.....	17
8.5 Product inspection, testing and evaluation .....	18
8.5.1 General.....	18
8.5.2 Materials of construction .....	18
8.5.3 Insulation material .....	18
8.5.4 Seals and sealant materials.....	18
8.5.5 Production control.....	18
8.6 Non conforming products.....	19

8.7	Corrective and preventive action.....	19
8.8	Handling, storage, packaging, preservation and delivery .....	19

## **Foreword**

The FNH- department "Domestic fireplaces for liquid fuel" develops within the framework of standardisation all essential heating and cooking appliances for liquid fuels.

The present standard defines the requirements of the construction and operating method, terms of operation test, production as well as marking and the instruction for decorative appliances producing a flame using ethanol based or gelatinous fuel.

This documents contains safety related regulations.

This document make demands on full operational appliances. Single components, like simple burning frames could not achieve the requirements in terms of this document (and present themselves as a safety risk, when used alone)

## **1 Scope**

This document applies for decorative appliances producing a flame using ethanol or gelatinous fuel. The appliances are used in closed rooms in the household as well as outdoors. Furthermore the appliances are used in household comparable rooms (based on their use) like e.g. Hotels, gastronomy, bureau- and best rooms at commercial area and beyond that in tents and comparable aerated places.

**NOTE** Beyond the household sector further regulations of using the appliance could apply.

This document applies for separate appliances and for built- in types whose fuel flow is limited on 0,5 l/h. Appliances with higher flow have to be treated as heater or rather fireplaces, so that they are going to be excluded from the scope of this standard. This heaters or rather fireplaces are building products and must be connected in terms of the BauPG and the MFeuVO onto an exhaust system.

This document applies for full operating appliances whose burner and fuel tank comprise one unit or going to be an integral part of the appliance, but not for appliances with separate fuel tank.

This document doesn't apply for appliances whose warm up or keep the food warm (Rechauds), as well as appliances for use in boats, trailer and other vehicles.

## **2 Normative references**

The following cited documents are essential for the application of this document. For dated references, subsequent amendments or revisions of any of these publications apply to this document. For undated references the latest edition of the publication referred to applies (including amendments)

DIN EN 60335-1: *Household and similar electrical appliances - Safety - Part 1: General requirements*

DIN EN 60335-2-102: *Household and similar electrical appliances - Safety - Part 2-2: Particular requirements for vacuum cleaners and water-suction cleaning appliances*

Standard and parts of DIN ISO 2859: *Sampling procedures for inspection by attributes*

DIN EN ISO 9001: *Quality management systems - Requirements (ISO 9001:2008); Trilingual version EN ISO 9001:2008*

BauPG: *Law on the market, and the free movement of construction products for the implementation of Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and*

*administrative provisions relating to construction and other acts of the European Communities (Construction Products Act; Published on April 28, 1998, Last modified October 2006)*

MFeuVO: *Musterfeuerungsverordnung (Released on 24 February 1995, last amended on 18 September 1997)*

### **3 Terms and definition**

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

#### **3.1**

##### **decorative appliances for the combustion of ethanol and paste-like fuels**

Appliance where ethanol and/or paste-like fuel could be burned for decorative purpose, but doesn't conduce for the purpose of heating

#### **3.2**

##### **Ethanol**

Transparent, combustible liquid whose chemical formula is  $C_2H_6O$ . Ethanol in terms of this standard also is a alloy of ethanol and water after the specification of the manufacturer

#### **3.3**

##### **Gelatinous fuel**

Combustible paste on base of ethanol, if applicable also propanol as well as thickener

#### **3.4**

##### **Fuel tank**

Basin where the ethanol is going to be feed into the burning gap

#### **3.5**

##### **Burning gap**

Absorption where ethanol is burned

#### **3.6**

##### **Full operating appliance**

Unit of combustion chamber and covering, which is going to be delivered completely from the manufacture or a combustion chamber for fitting in defined covering after instruction of the manufacture

#### **3.7**

##### **Burner**

Whole unit of fuel tank, containment and burning gap

#### **3.8**

##### **Containment**

Basin, where the fuel tank is arranged, which could contain overflow fuel

#### **3.9**

##### **minimal burning adjustment**

Adjustment of the appliance where the minimal amount of fuel is accomplished

#### **3.10**

##### **maximum burning adjustment**

Adjustment of the appliance where the maximum amount of fuel is accomplished

## **4 Construction**

### **4.1 General**

The possible maximum fuel capacity of the fuel tank of the appliance should not cross a volume of 3 l.

At table top unit possible maximum fuel capacity of the fuel tank of the appliance should not cross a volume of 0,5 l.

The appliance must have a manageable closure Advice (which result in expiration of flame). This attachment must be able to handle riskless – when indicated via implement.

#### **4.1.1 Materials**

The quality of the materials as well as form and rating of the components must assure, that the appliances are durable safety and operational on suitable duration at conventional operating and therewith associated, mechanical, chemical and thermal conditions.

In this connection it is important to allow for the aspect of corrosion under the chemical additional load by ethanol. When chrome nickel steel 1.4301 or higher ones are used for the burner, then the aspect mentioned above is achieved and applies.

The burner and all components, rising above a temperature of 85 °C must be made of non combustible material.

The appliance must be laid out, so that

- there are no deformations or other disadvantages visible at the appliance after the testing;
- it has the ability to resist against the arising strains at normal handling;
- it could operate riskless.

### **4.2 Stability**

The appliance should not tilt at operating. This could be reached when an equal attachment for fastening the appliance is arranged and when the equal advice is noticed in the installation guideline.

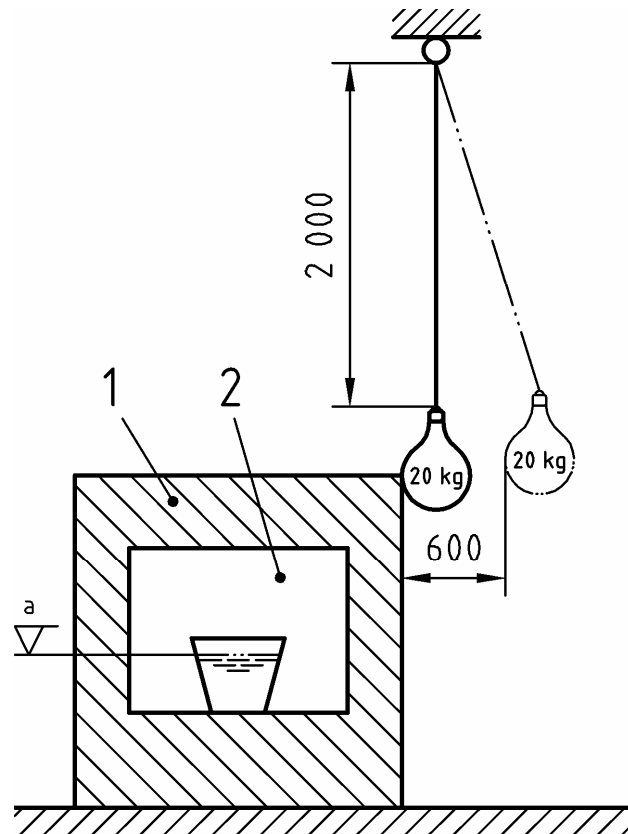
Otherwise following tests have to be made.

#### **4.2.1 Safety against overthrow**

The appliance is arranged on a flat surface of glass.

A sandbag with a total volume of 20 kg is suspended on a rope with a length of 2 m, so that it is arranged freely suspended directly beside the unfavourable point of the appliance (in regard to the stability) at a specific amount of 1 m or rather at the amount of the top edge of the appliance, if the amount of the appliances doesn't achieve 1 m. The sandbag is going to be linked about 600 mm and then it is going to swing freely to the appliance. Thereby the appliance shouldn't tilt.

For table unit the oscillation is reduced to 250 mm. Further the table unit shouldn't move more than 300 mm from his position while testing.



### Legend

- 1 fireplace
- 2 combustion chamber
- a maximum acceptable filling height of water

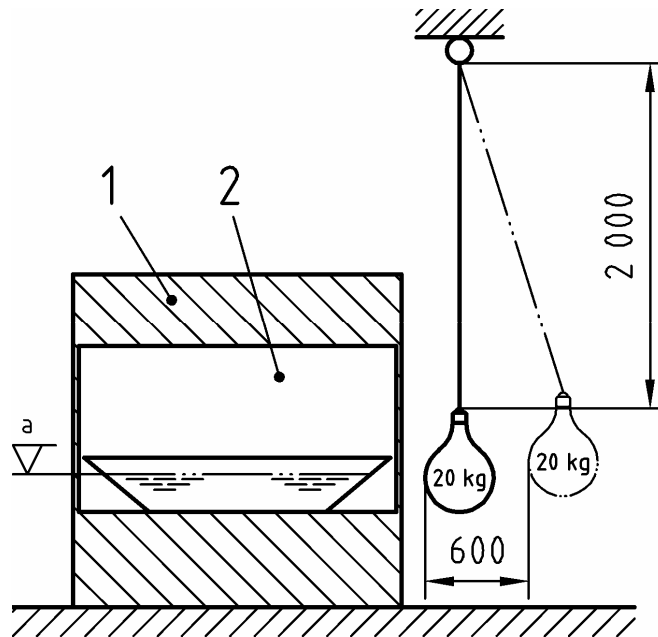
**Figure 1 — Overthrow test for appliances**

#### 4.2.2 Safety against loss of fuel by striking against the appliance

The appliance is arranged on a flat surface of glass. The fuel tank is going to be filled with water until the filling height is reached.

A sandbag with a total volume of 20 kg is suspended on a rope with a length of 2 m, so that it is arranged freely suspended directly beside the unfavourable point of the appliance (in regard to the stability) at a specific amount of 1 m or rather at the amount of the top edge of the appliance, if the amount of the appliances doesn't achieve 1 m. The sandbag is going to be linked about 600 mm and then it is going to swing freely to the appliance. Thereby the appliance should not leak more than 10 ml of water.

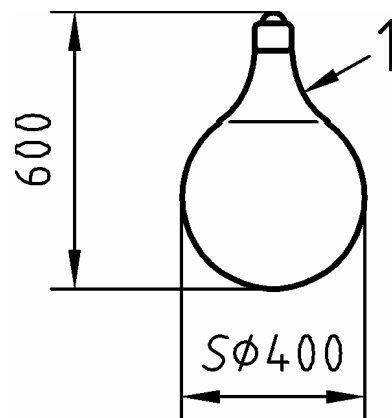
For table unit the oscillation is reduced to 250 mm.



**Legend**

- 1 fireplace
- 2 combustion chamber
- a maximum acceptable filling height of water

**Figure 2 — Safety test against the loss of fuel at striking the appliance**



**Legend**

- 1 Leather covering

**Figure 3 — Example of a sandbag (identical with EN 1860-1: 2003)**

### 4.2.3 Safety against tilting and sliding

The appliance is arranged on a flat inclinable surface of glass without fixing.

The surface is going to be incline bit by bit till 10° to all 4 sides of the appliance. The appliance shouldn't tilt or slide.

The cruise of inclination shouldn't cross  $1,5^\circ \pm 0,5^\circ$  pitch/second.

### 4.2.4 Appliance with a safety shutdown or rather safety leakage in case of tilting

If a appliance is equipped with a rapid shut down or a leakage safety in case of tilting, the tests after 4.2.1 till 4.2.3 could be dropped, when the rapid shut down fulfill following requirements:

- A complete prevention of the combustion process must be assured. A maximum heel of 10ml fuel could leak from the appliance while tilting.
- It must be conditioned and located so, that is reachable and easy to handle.

The testing of the rapid shut down or the leakage safety happens by tilting the appliance. Thereby upper requirements must be fulfilled.

### 4.3 Safety against the leakage of fuel

The test is going to be accomplished for all appliances, the appliances which have to be fixed and the ones hanging on the wall.

The appliance is arranged on a flat inclinable surface of glass without fixing. The fuel tank is going to be filled with water until the die fill.

The surface is going to be inclined bit by bit till 5° to all 4 sides of the appliance. Thereby no water should leak from the fuel tank.

The cruise of inclination shouldn't cross  $1,5^\circ \pm 0,5^\circ$  pitch/second.

### 4.4 Fuel tank

Fuel tank has to be accomplished closely. For this a test has to be carried out with an over pressure of 0,5 bar or a comparable testing. There should be no fractions, breaks or other damages. While testing the fuel tank no viewable leakage should appear for example while testing on the basis of blistering (under water or using leakage spray).

The appliance has to be constructed so that it isn't possible that fuel is going to resign from it. For this purpose a second external tank with a minimum of 110% of real fuel tank volume has to be arranged. This could occur in the form of a double wall construction.

A Advice has to be included, which averts a flooding of the fuel while filling, after human discretion foreseeable terms of use. A level meter/ mark is an adequate Advice.

The appliance has to be occupied with a well seen and lasting sign that signalize that a filling at operation and in hot state is not allowed:



**Figure 4 — Symbol "Filling at operation and warm state not allowed"**

The sign must have a height of minimum 25 mm. The colouring of signs insert in metal (e.g. gravity, laser) are dispensable.

#### **4.5 Igniter**

The appliance has to be ignited safely.

If the appliance has an ignition Advice the operation has to be possible without removing the covering. If the appliance has got non ignition Advice, the user must have the opinion to maintain a horizontal minimum distance to the burner of 140 mm.

In case the appliance doesn't have a horizontal access to the ignition (ignition above) an ignition Advice is obligatory.

### **5 Operating method**

#### **5.1 General**

All tests of this paragraph regarding firing are going to be arranged at maximum as well as minimum cessation of operating burner, when it is not specified.

A cessation of operating in this spirit is a constructive given adjustment of the burner for example, in terms of a slide threshold. When a constructive given minimal adjustment of the burner doesn't exists, the minimal cessation of operating has to be detected as a range of expiration flames for the tests.

## 5.2 Test conditions

All tests are going to be arranged with the specified fuel given by the manufacture.

Testing room:

- Temperature  $23\text{ °C} \pm 5\text{ °C}$
- Relative humidity between 30 % and 90 % RLF.

**Table 1 — Uncertainty of measurement**

Indicator	Uncertainty of measurement
Gas analysis	
CO	$\leq 10\%$ regard to 30 ppm
CO <sub>2</sub>	$\leq 2\%$ regard to 5000 ppm
Temperature	
Room	$\leq 2\text{ K}$
Surface	$\leq 2\text{ K}$
Touchable surface	$\leq 2\text{ K}$
Mass	
Fuel consumption	$\pm 10\text{ g}$

## 5.3 Fuel flow

The assignment of the fuel flow is carried out by maximum adjustment as 60-minutes-average value over the whole burning period. If the burning period is less than 60 minutes, then it is going to be detected over the entire burning period.

The detection of the fuel flow could be defined via visual test of a fill level indication or by building an appliance onto an exact scale to measure the lessening of the mass.

Non of the 60-minutes-single value should cross 0,5 l/h. For gelatinous fuel this applies in regard to the energetic ethanol-equivalent.

At maximum cessation of operating the burning period should not cross 14 hours.

## 5.4 Reliability

The appliance has to be constructed in a way, so that a spurting out of the flames by normal air draft could be adverted by a given safe distance of the manufacture.

This given safe distance of the manufacture should not cross 50 cm.

Selected air flow of 2m/s in and beneath the flame area (parallel to leading- and lateral edge of the appliance).

## **5.5 Combustion performance**

Detection of the emission of CO and CO<sub>2</sub> in closed room at minimum and maximum cessation of operating.

At minimum room volume given by the manufacture the following threshold at air change of 0,5/h in the setting up room in minimum and maximum cessation of operating should not cross while the entire burning period:

- 30 ppm CO
- 5000 ppm CO<sub>2</sub>

NOTE The production of thermal NO<sub>x</sub> is not given, because of the combustion temperature underneath 1000 °C. At combustion of ethanol a production of fuel NO<sub>x</sub> is also not given.

## **5.6 Fire safety**

### **5.6.1 General**

The following tests have to be detected at maximum adjustment of the burner.

### **5.6.2 Floor temperature**

The surface temperature on the floor of test bench should not cross 60 K over room temperature.

This requirement does not apply, when the manufacture specifies that the appliance could not be installed onto combustible floor.

### **5.6.3 Partition temperature**

The surface temperature on the test bench behind and beside the appliance should not cross the minimum distance 60 K over the room temperature given in the instructions of the manufacture.

If the manufacture specifies that the distance to the combustible items and components amount minimum 1 m, then the tests could not apply.

### **5.6.4 Temperature of the operating handles**

The temperature of the operating handles on the surface of contact should not cross the room temperature more than:

- |             |      |
|-------------|------|
| — Metal     | 35 K |
| — Porcelain | 45 K |
| — Plastics  | 60 K |

This also applies for other equal materials.

This temperature could trespass, if an accessory is going to be delivered with the appliance that handles the cessation of operating easily and without fire hazard.

### 5.6.5 Temperature of touchable surface

In state of stability at maximum adjustment of the burner the temperature of the parts at facade and side walls, which could be touched accidentally, should not cross the room temperature more than following values:

— Metal and painted metal space	60 K
— Enamel metal	65 K
— Glass and ceramic	80 K
— Plastic	100 K

The threshold for the rise of temperature of 100 K also deals with plastics with a metal coating, which thickness amount under 0,1 mm.

**NOTE** If the thickness of plastic surfaces amount not more than 0,3 mm, then the thresholds apply for the rise of temperature of the substrate.

Following requirements doesn't apply for the parts on the facade and side walls:

- Which are not accessible for a test pin with a diameter of 75 mm and hemispherical end; or
- Which have low dimensions, e.g. aeration and de- aeration opening as well as articulations and parts where the surface is less wide than 10 mm; or
- Parts, being arranged 5 cm around the aeration opening; or
- Glass surfaces, which are noticeable as hot surface because of the viewable flames as well as their apron with a maximum wide of 10 cm, or
- Which are less than 10 cm off undisguised and exposed shell opening to the burning crack.

### 5.6.6 Ignition, expiration of flame, relighting (from warm/cool state)

A risk less ignition from cool state must be able (appliance at room temperature), also at reduced amount of fuel. Thereby the fuel has to be filled until the maximum die fill and has to be ignited. After the burning period of 3 minutes the flames have to be eliminated with the closing Advice and abandoned at covered state until the reach of the ambient air temperature or rather maximum 1 h. Thereafter the cover has to be removed and the fuel has to be relighted. The ignition must occur, so that a stable flame is formed and whether the flame nor the fuel should resign as e.g. droplet from the appliance.

The ignition must be arranged at cool state with a filling of the fuel tank of 50 %, 25 % and 10 %, independent from the specifications in the instruction manual of the manufacture. If the appliance doesn't ignite at reduced amount of fuel at cool state, then the requirements are achieved. In that case adequate references have to be tested from the instruction manual.

The risk less reigniting and filling of appliances have to be tested at a fuel tank temperature of 60 °C.

If the temperature of the fuel tank or other decorative accessories, like ceramic log imitation is directly higher after eliminating the flame, time has to be recorded, until the temperature is under 60 °C. It has to be checked if the information in the instruction manual is harmonious.

Reaching the temperature 60 °C of the burner on the hottest point from neither warm state, then nor flame should be in the appliance. Hereunto the appliance has to be gutted completely and the requirements have

to be checked visual. A second test has to be carried out by eliminating the flame using the closing Advice after 90 % of the fuel has been burned.

Appliances with brin filling in the burner should not carry out a visual noticeable further burning in the brin filling at burning out.

### **5.6.7 Predictable failure**

The tests in 5.4 and 5.6 have also been arranged with commercial methylated spirit.

This test could be omitted, when the ethanol content of the fuel is  $\geq 94$  % as prescribed by the manufacture.

## **5.7 Electrical safety**

DIN EN 60335-1 and DIN EN 60335-2-102 apply for all appliances using auxiliary energy.

## **6 Marking**

### **6.1 General**

The letters of the mark must be 2 mm high.

The use of pictogram is destined. The meaning of pictogram must be illustrated in the instruction manual.

The signs must be readable while testing. After the tests the marking has to be readable and the signs shouldn't feature formings or beginning delaminations.

### **6.2 Type plate**

The appliance must conform following details, which are going to be affixed durable, readable, smudge and in German language on the appliance, so that a readability is assured even after the installation:

- Name and addresser of manufacture
- Commercial description of the appliance
- Identification number if the manufacture uses one
- Sort and type of the using fuel
- Capacity
- Intervals to the combustibile materials and objects
- Minimum room volume

### **6.3 Warning plate**

The appliance must furnish with a viewable and durable plate with following readable details:

- Not applicable for continuous duty
- Only use the designed fuel

- Only operate in ventilated rooms
- Before operating the instruction manual have to be read intently

#### **6.4 Marking on the package (to check)**

Following references must be specified on the package:

- Application of the appliance
- First launch
- Sort and type of the using fuel
- the symbol "Before starting read the instruction manual!"
- the advice "Appliance for temporary operation"
- a advice for shops selling the recommended liquid and gelatinous fuel
- Number of this standard

If a sticker is used, it must be durable and abrasion proofed. It should not change colour so that the marking couldn't been read anymore at normal operation. Sticker shouldn't been destroyed as a result of dampness and temperature effect (flaking).

Fuels (for example the trademark of the fuel or the advice that the fuel could be ordered at the shop where the appliance is from). In another clause the regulations for the package and storage of the fuel are mentioned.

## **7 Instructions**

### **7.1 General**

Written instruction for installation, operating, attendance and if applicable for the assembly of the appliance at the site of operation have to be in the language of the land, where the appliance is going to be delivered.

### **7.2 Installation instruction**

The install instruction must have at least following Advices:

- Advice of national and local directions, which have to be minded for the installation of the appliance
- Type of appliance
- Real assembly of detachable parts
- Horizontal, stable installation
- Weight of the appliance in kg
- Advice about the positioning of the appliance on flat head
- Name and addresser of the manufacture

- Commercial marking of the appliance
- Identification number if the manufacture uses one
- Intervals to the combustible materials and objects
- Minimum room volume
- The requirements to the feeding of combustion air and if applicable to the aeration and the operating with other fireplaces
- advice for the positioning of the fireplace only on adequate capacity of the area of assembly. At inadequate capacity, applicable arrangements (e.g. panel for load sharing) must be decided to reach them
- the assembly of the fireplace at delivery in prefabricated parts, if applicable
- advice about the safe fastening of appliances, especially with wall hanging appliances

### **7.3 User operating instructions**

The user operating instruction must have at least following information:

- Advice of national and local directions, which have to be minded for the installation of the appliance
- Instruction for the refilling of fuels, about the maximum die fill and burning period
- describing of the real and safe operating of the appliance and over the ignite process
- advice of the minimum size and of the aeration
- advice of arrangements at reigniting after a rapid shut down
- Warning: „The appliance couldn't been ignite at hot state“
- advice of real operation of the adjustment device and controls
- aeration requirements for synchronous operating with other appliances for combustion of ethanol, if applicable
- precaution against fire danger of combustible components
- Warning that the construction of the appliance couldn't been changed
- Advice of the assembly that only spare parts, allowed by the manufacture could be used
- Name and addresser of the manufacture
- Commercial marking of the appliance
- Identification number if the manufacture uses one
- Intervals to the combustible materials and objects
- Commentary of the advice- and warning signs

- A register of recommended fuels
- Error detection and the way of a safe shutdown of the fireplace at breakdown
- A warning that parts of the fireplace -especially the surfaces- getting hot while operating and that a adequate attention is necessary

Fuels (for example the trademark of the fuel or the advice that the fuel could be ordered at the shop where the appliance is from). In another clause the regulations for the package and storage of the fuel are mentioned.

## **8 Factory owned production control system**

### **8.1 General**

The manufacture erected, documented and maintains a continuous factory-owned production control system and defines the field of activity to ensure that the products putted into circulation conform to the denoted performance feature. The factory owned control system enfolded methods, constant check-up and tests and/or ratings as well as the use of the results to control factory- or other substances or assemblies of the technical appliances of the production process and its product, and the product must be conform to the requirements in 8.5.

**NOTE** For conforming the requirements a continuous factory owned production control system after DIN EN ISO 9001 or other equal and according to the standard factory owned production control system comes into consideration.

The manufacture arranges in the context of his factory owned production control system tests for controlling the conformity of product. Samplings, tests or rating result from standard of the series DIN ISO 2859 (all parts). The results of the check-up, tests or rating which show need for action, as well as the touched arrangements are going to be recorded. The arrangements for control values or criteria at non conforming are going to be recorded.

### **8.2 Materials and prefabricated parts**

The specifications of all incoming materials and prefabricated parts 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 prefabricated parts.

### **8.3 Control of assay-, measurement and test appliances**

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

### **8.4 Process control**

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

## **8.5 Product inspection, testing and evaluation**

### **8.5.1 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.

### **8.5.2 Materials of construction**

- a) Type – composition/specifications
- b) Thickness
- c) Dimensions
- d) Surface condition

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

### **8.5.3 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.

### **8.5.4 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.

### **8.5.5 Production control**

#### **Construction and dimension**

The Construction and dimensions of the following critical components will be tested at production and/or completion:

- a) Adjustment device
- b) Combustion chamber construction

- c) Convection system

#### **Other control action**

At least the following control actions will be arranged for each individually produced appliance during the manufacturing process:

- a) Tightness of burner

### **8.6 Non conforming products**

The manufacturer shall establish and maintain documented procedures to ensure that a non-defined requirement product could be clearly identified and its placing is prevented. These procedures have to foresee the documentation and distance of the product and the notification of relevant bodies. Repaired and/or reworked products will be proofed, according to the investigation-, testing- and evaluation plan.

### **8.7 Corrective and preventive action**

The manufacturer shall establish documented procedures for accomplishment corrective and preventive measures and maintains them. The manufacturer notes from changes to the documented procedures and records them.

### **8.8 Handling, storage, packaging, preservation and delivery**

Insofar as to ensure the product conformity with the defined requirements needed, the manufacturer shall establish documented procedures for promotion, storage, packaging, preservation and delivery of the end product after final inspection and maintains them.