



**SLOVENSKI STANDARD**  
**SIST EN 50465:2009**

**01-januar-2009**

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**Plinske naprave - Naprave za ogrevanje s plinskimi gorivnimi celicami - Naprave za ogrevanje s plinskimi gorivnimi celicami z imensko močjo do vključno 70 kW**

Gas appliances - Fuel cell gas heating appliance - Fuel cell gas heating appliance of nominal heat input inferior or equal to 70 kW

Gasgeräte - Brennstoffzellen-Gasheizgerät - Brennstoffzellen-Gasheizgerät mit einer Nennwärmebelastung kleiner oder gleich 70 kW

Appareils fonctionnant au gaz - Appareil à gaz produisant de la chaleur au moyen d'une pile à combustible - Appareil de chauffage produisant de la chaleur au moyen d'une pile à combustible dont le débit calorifique nominal est inférieur ou égal à 70 kW

**Ta slovenski standard je istoveten z: EN 50465:2008**

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**ICS:**

27.070	Gorilne celice	Fuel cells
97.100.20	Plinski grelniki	Gas heaters

**SIST EN 50465:2009**

**en,fr,de**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 50465**

October 2008

ICS 27.070; 97.100.99

English version

**Gas appliances -  
Fuel cell gas heating appliances -  
Fuel cell gas heating appliance of nominal heat input  
inferior or equal to 70 kW**

Appareils fonctionnant au gaz -  
Appareils à gaz produisant de la chaleur  
au moyen d'une pile à combustible -  
Appareil de chauffage produisant  
de la chaleur au moyen d'une pile  
à combustible dont le débit calorifique  
nominal est inférieur ou égal à 70 kW

Gasgeräte -  
Brennstoffzellen-Gasheizgeräte -  
Brennstoffzellen-Gasheizgerät  
mit einer Nennwärmebelastung  
kleiner oder gleich 70 kW

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Ref. No. EN 50465:2008 E

## Foreword

This European Standard was prepared by the CEN/CLC/JWG FCGA, "Fuel cell gas appliances".

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50465 on 2008-05-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2009-05-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2011-05-01

This European Standard has been prepared under Mandate M/349 given to CEN and CENELEC by the European Commission and the European Free Trade Association and covers essential requirements of EC Directive 90/396/EEC (see Annex ZZ, which is an integral part of this document).

The essential requirement of EC Directive 90/396/EEC relating to "rational use of energy" is defined by the maximum quantity of energy recovered (thermal and electrical energy output) from the gas energy input.

This European Standard deals with a very early state of new technology. The requirements of this European Standard are not intended to constrain innovations. When considering materials, designs or constructions not specifically dealt with in this European Standard the alternatives shall be evaluated as to their ability to yield levels of safety and performance equivalent to those prescribed by this European Standard. This can be done by a risk assessment. Furthermore not all requirements could be described in detail up to now. This is valid both for the requirements and the test procedures. This will be done in later revisions of this European Standard. Guidance to fuel cell stacks and their performance may be found in EN 62282-2.

Due to the development of new technology other solutions than those described in this standard are possible if these solutions provide at least an equivalent level of safety.

Matters related to quality assurance systems, tests during production, and certificates of conformity of auxiliary devices are not dealt with in this European Standard.

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## 1 Scope

This European Standard applies to the construction, the safety, the functional requirements and the test methods, as well as the classification and the marking of a fuel cell gas heating appliance, which will be operated predominantly heat followed, meeting the following boundary conditions:

- maximum heat load (gas input): 70 kW
- maximum electrical output: 11 kW.

NOTE Due to the fact, that there are national deviations on the maximum electrical output in Europe, this maximum electrical output is independent referring the number of connected phases to the public low voltage grid.

- fuel: combustion gas in accordance with EN 437
- maximum heating water temperature: 95 °C (under normal operational conditions)
- process pressures in the fuel cell gas appliance:
  - heating water: max. 6 bar
  - domestic hot water (if installed): max. 10 bar
- device construction: According to the expositions in accordance with CEN/TR 1749, EN 483 or EN 297 (B<sub>22</sub>, B<sub>23</sub>, B<sub>32</sub>, B<sub>33</sub>, C<sub>12</sub>, C<sub>13</sub>, C<sub>32</sub>, C<sub>33</sub>, C<sub>42</sub>, C<sub>43</sub>, C<sub>52</sub>, C<sub>53</sub>, C<sub>62</sub>, C<sub>63</sub>, C<sub>82</sub>, C<sub>83</sub>)<sup>1)</sup>.

This European Standard applies to type testing only.

This European Standard does not contain the requirements necessary for appliances for producing electrical energy without thermal energy.

## 2 Normative references

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

EN 88	Pressure governors for gas appliances for inlet pressures up to 200 mbars
EN 125	Flame failure devices
EN 126	Multifunctional controls for gas burning appliances
EN 161	Automatic shut-off valves for gas burners and gas appliances
EN 297	Heating boilers operated with gaseous fuels – Type B <sub>11</sub> + B <sub>11BS</sub> boilers of nominal heat input not exceeding 70 kW
EN 298	Automatic gas burner control systems for gas burners and gas burning appliances with or without fans

<sup>1)</sup> The classification used in this European Standard is based on upon the classification of CEN/TR 1749.



EN 437:1993 + A1:1997	Test gases, test pressures and categories of appliance, for gas appliances
EN 483:1999 + A2:2001	Gas-fired central heating boilers – Type C boilers of nominal heat input not exceeding 70 kW
EN 549	Rubber materials for seals and diaphragms for gas appliances and gas equipment
EN 677:1998	Gas fired central heating boilers Specific requirements for condensing boilers with a nominal heat input not exceeding 70 kW
EN 1057	Copper and copper alloys – Seamless, round copper tubes for water and gas in sanitary and heating applications
EN 1443	Chimneys – General requirements
CEN/TR 1749	European scheme for the classification of gas appliances according to the method of evacuation of the products of combustion (types)
EN 1856-1	Chimneys – Requirements for metal chimneys – Part 1: System chimney products
EN 1856-2	Chimneys – Requirements for metal chimneys – Part 2: Metal liners and connecting flue pipes
EN 1859	Chimneys – Metal chimneys – Test methods
EN 10029	Hot rolled steel plates 3 mm thick or above; tolerances on dimensions, shape and mass
EN 12067-1	Gas/air ratio controls for gas burners and gas burning appliances – Part 1: Pneumatic types
EN 12067-2	Gas/air ratio controls for gas burners and gas burning appliances – Part 2: Electronic types
EN 13611	Safety and control devices for gas burners and gas-burning appliances – General requirements
EN 14459	Methods of risk analysis for the use of electronics in systems and control functions for gas burners and gas burning appliances
EN 50438	Requirements for the connection of micro-generators in parallel with public low-voltage distribution networks
EN 60335-1	Household and similar electric appliances – Safety – Part 1: General requirements (IEC 60335-1, modified)
EN 60335-2-102	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, modified)
EN 60529	Degrees of protection provided by enclosures (IEC 60529)
EN 60730-2-9	Automatic electrical controls for household and similar use – Part 2-9: Particular requirements for temperature sensing controls (IEC 60730-2-9, modified)
EN 61000-3-2	Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current $\leq 16$ A per phase) (IEC 61000-3-2)

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EN 61000-3-3	Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current $\leq 16$ A per phase and not subject to conditional connection (IEC 61000-3-3)
EN 61000-6-1	Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity for residential, commercial and light-industrial environments (IEC 61000-6-1)
EN 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments (IEC 61000-6-2)
EN 61000-6-3	Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments (IEC 61000-6-3)
EN 61000-6-4	Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments (IEC 61000-6-4)
IEC/TS 62282-1	Fuel cell technologies – Part 1: Terminology
EN 62282-2:2004	Fuel cell technologies – Part 2: Fuel cell modules (IEC 62282-2:2004)
EN ISO 3166-1	Codes for the representation of names of countries and their subdivisions – Part 1: Country codes (ISO 3166-1)
EN ISO 4063	Welding and allied processes – Nomenclature of processes and reference numbers (ISO 4063)
CR 1404	Determination of emissions from appliances burning gaseous fuels during type-testing
ISO 7-1	Pipe threads where pressure-tight joints are made on the threads – Part 1: Designation, dimensions and tolerances
ISO 228-1	Pipe threads where pressure-tight joints are not made on the threads – Part 1: Designation, dimensions and tolerances
ISO 262	ISO general purpose metric screw threads – Selected sizes for screws, bolts and nuts
ISO 301	Zinc alloy ingots intended for casting
ISO 857	Welding, brazing and soldering processes – Vocabulary
ISO 2553	Welded brazed and soldered joints – Symbolic representation on drawings
ISO 7005-1	Metallic flanges – Part 1: Steel flanges

### 3 Definitions

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

#### 3.1

##### reference conditions

these correspond to 15 °C and 1 013,25 mbar, unless otherwise specified

[3.9 of EN 437:1993, modified]

NOTE 1 mbar = 10<sup>2</sup> Pa.

## 3.2 combustible gases

### 3.2.1 test gases

gases intended for the verification of the operational characteristics of appliances using combustible gases

[3.2 of EN 437:1993, modified]

In each gas family or group, test gases are defined

### 3.2.2 reference gas

test gas on which appliances operate under nominal conditions, when they are supplied at the corresponding normal pressure condensed

[3.3 of EN 437:1993]

### 3.2.3 limit gases

test gas representative of the extreme variations in the characteristics of the gases for which appliances have been designed

[3.4 of EN 437:1993]

### 3.2.4 calorific value

quantity of heat produced by the complete combustion, at a constant pressure of 1 013,25 mbar of unit volume or mass of gas, the constituents of the combustible mixture being taken at reference conditions and the combustion products being brought to the same conditions

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A distinction is made between

- gross calorific value in which the water produced by combustion is assumed to be condensed
  - symbol:  $H_s$
- net calorific value in which the water produced by combustion is assumed to be in the vapour state
  - symbol:  $H_i$
  - unit: either megajoule per cubic metre ( $\text{MJ}/\text{m}^3$ ) of dry gas brought to reference conditions, or megajoule per kilogram ( $\text{MJ}/\text{kg}$ ) of dry gas

[3.11 of EN 437:1993/A1:1997, modified]

### 3.2.5 relative density

ratio of the masses of equal volumes of dry gas and dry air under the same conditions of temperature and pressure: 15 °C and 1 013,25 mbar

Symbol:  $d$

[3.10 of EN 437:1993, modified]

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**3.2.6****Wobbe index**

ratio of the calorific value of a gas per unit volume to the square root of its relative density under the same reference conditions. The Wobbe index is said to be gross or net according to whether the calorific value used is the gross or net calorific value

Symbol: gross Wobbe index:  $W_s$   
net Wobbe index:  $W_i$

Unit: either megajoule per cubic meter ( $\text{MJ}/\text{m}^3$ ) of dry gas at the reference conditions,  
or megajoule per kilogram ( $\text{MJ}/\text{kg}$ ) of dry gas

[3.12 of EN 437:1993/A1:1997, modified]

**3.2.7****gas pressure****3.2.7.1****general**

all the pressures are static pressures of the moving gas, relative to the atmospheric pressure, measured at right angles to the direction of flow of the gas

Symbol:  $p$

Unit: millibar (mbar)

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**3.2.7.2****test pressures**

gas pressures used to verify the operational characteristics of appliances using combustible gases. They consist of normal and limit pressures

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Unit: millibar (mbar) <https://standards.iteh.ai/catalog/standards/sist/0d91e16c-7144-468d-8919-c402321f8f00/sist-en-50465-2009>

[3.5 of EN 437:1993]

**3.2.7.3****normal pressure**

pressure under which the appliances operate in nominal conditions when they are supplied with the corresponding reference gas

Symbol:  $p_n$

[3.6 of EN 437:1993]

**3.2.7.4****limit pressures**

pressures representative of the extreme variations in the appliance supply conditions

Symbols:

- maximum pressure:  $p_{\max}$
- minimum pressure:  $p_{\min}$

[3.7 of EN 437:1993]

### 3.2.7.5

#### pressure couple

combination of two distinct gas distribution pressures applied by reason of the significant difference existing between the Wobbe indices within a single gas family or group in which

- the higher pressure corresponds only to gases of low Wobbe index,
- the lower pressure corresponds to gases of high Wobbe index

[3.8 of EN 437:1993]

### 3.3

#### fuel cell gas heating appliance

appliance which produces simultaneous thermal energy and electrical energy (electrochemical reaction) from only one primary energy source

The fuel cell gas heating appliance consists typically of distinct parts (see Figure 1):

1. **the fuel processing system:** chemical processing equipment including any associated heat exchangers and controls required to convert input fuel to a composition suitable for the fuel cell stacks [3.24 of IEC/TS 62282-1];
2. **the fuel cell module:** assembly including a fuel cell stack(s) which electrochemically converts chemical energy to electric energy and thermal energy intended to be integrated into the fuel cell gas heating appliance [3.21 of IEC/TS 62282-1, modified];
3. **the power conditioning system:** equipment which is used to change the magnitude or waveform of the voltage, or otherwise alter or regulate the output of a power source [3.50 of IEC/TS 62282-1];
4. **the internal thermal management and the thermal conditioning system:** the internal thermal management system provides cooling and heat rejection to maintain equilibrium within the fuel cell gas heating system, assists in heating the power train during start up and supplies heat to the thermal conditioning system.

This module can be divided in two parts if the thermal conditioning system is external (see Figure 2).

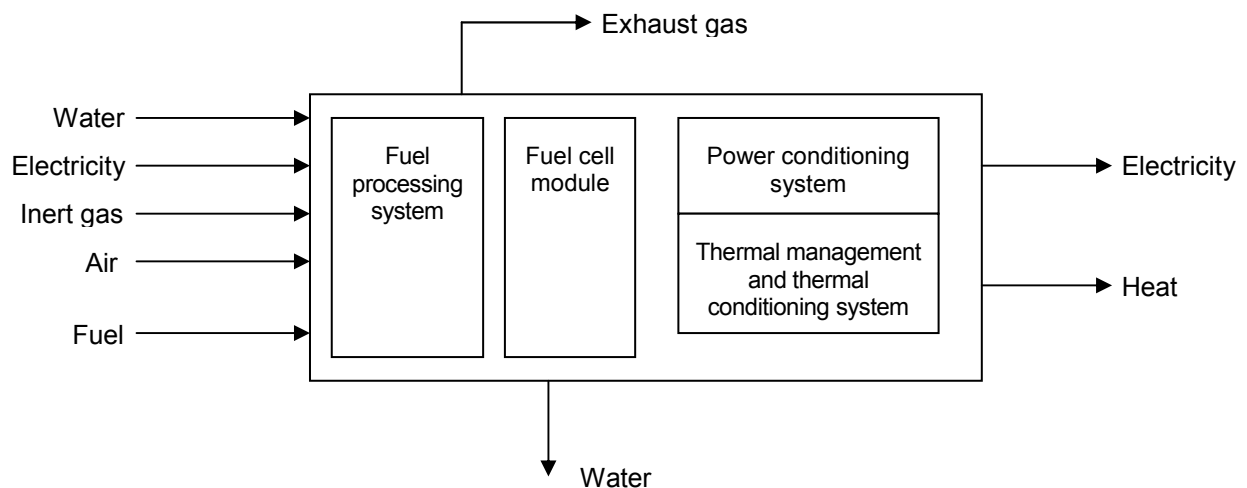


Figure 1 – Typical set-up of a fuel cell gas heating appliance (all-in-one type)

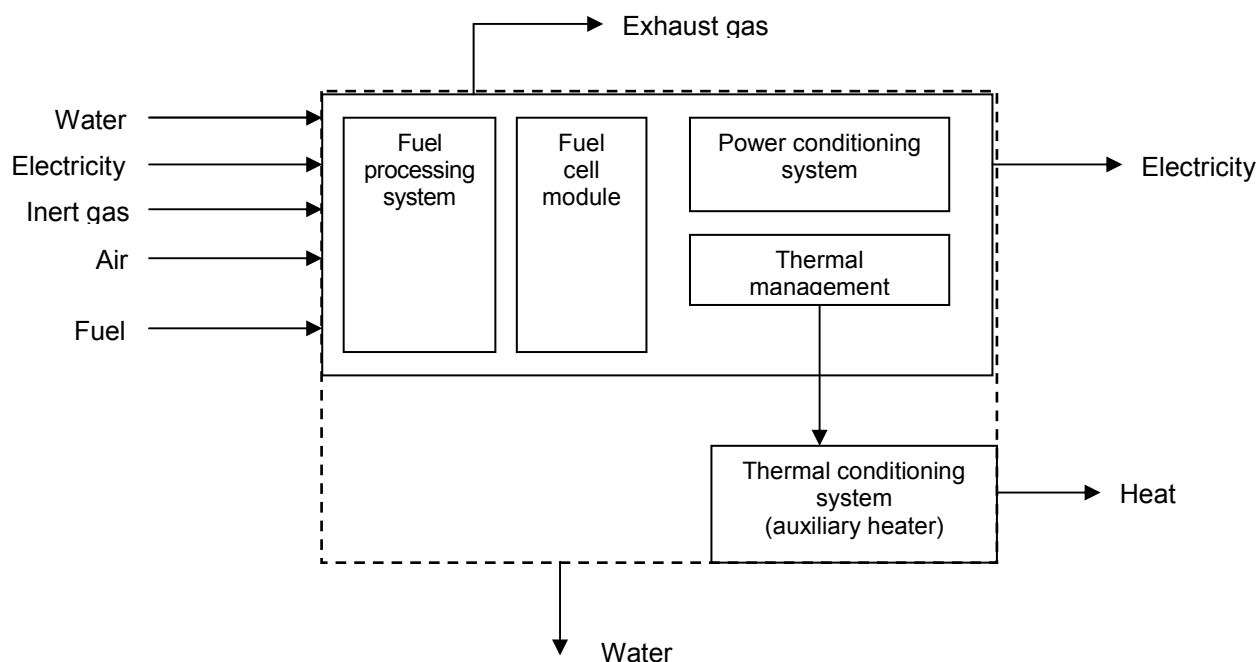


Figure 2 – Fuel cell gas heating appliance with external thermal conditioning system

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### 3.4 constituent parts of the fuel cell gas heating appliance

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#### 3.4.1 supplied gas

gaseous fuel in vapour phase at 15 °C, 1 013,25 mbar, which supplies the fuel cell gas appliance to be transformed in a process gas and to supply a burner if necessary.

It is represented by the tests gases described in EN 437 and is called “gas” in this standard

#### 3.4.1.1 gas inlet connection

part of the fuel cell gas heating appliance intended to be connected to the gas supply

#### 3.4.1.2 gas circuit

assembly of parts of the fuel cell gas heating appliance that carry or contain the combustible gas between the fuel cell gas heating appliance gas inlet connection and the point at which air is admitted or the point at which the supplied gas is reformed into process gas

#### 3.4.1.3 process gas circuit

assembly of parts of the fuel cell gas heating appliance that carry or contain the process gas between the fuel processing system, the fuel cell module and the after burning unit (if available)

#### 3.4.1.4 restrictor

device, which is placed in the gas circuit so as to create a pressure drop and thus bring the gas pressure at the burner to a predetermined value for a given supply pressure and a given rate

**3.4.1.5****injector**

component that admits gas into a burner

**3.4.1.6****gas rate adjuster**

component allowing the gas rate of a burner to be brought to a predetermined value according to the supply conditions.

The action of operating this device is called “adjustment of the gas rate”

**3.4.1.7****range-rating device**

component on the fuel cell gas heating appliance intended to be used by the installer to adjust the nominal heat input of the fuel cell gas heating appliance within the range of maximum and minimum heat inputs stated by the manufacturer, to suit the actual heat requirements of the installation

**3.4.1.8****primary aeration adjuster**

device enabling the primary aeration of a burner to be set to the desired value according to the supply conditions

**3.4.1.9****sealing an adjuster or control device**

arrangements made to make evident any attempt to change its adjustment (e.g. breakage of a device or a sealing material).

A sealed adjuster or control device is considered to be non-existent

**3.4.1.10****putting an adjuster or control device out of service**

action intended to put an adjuster or control (rate, pressure, etc.) out of service

**3.4.1.11****burners****3.4.1.11.1****main burner**

burner that is intended to assure the thermal function of the fuel cell gas heating appliance and is generally called “the burner”

**3.4.1.11.2****premixed burner**

burner in which the gas and a quantity of air at least equal to that theoretically necessary for complete combustion are mixed before the flame ports

**3.4.1.11.3****catalytic burner**

burner (oxidizer) in which the gas and a quantity of air at least equal to that theoretically necessary for complete combustion are mixed before the reaction zone, with a flameless combustion taking place in the reaction zone which is supported by catalysts