



SLOVENSKI STANDARD

SIST EN 677:1999

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Plinski kotli za centralno ogrevanje – Posebne zahteve za kondenzacijske kotle z imensko močjo do vključno 70 kW

Gas-fired central heating boilers - Specific requirements for condensing boilers with a nominal heat input not exceeding 70 kW

Heizkessel für gasförmige Brennstoffe - Besondere Anforderungen an Brennwertkessel mit einer Nennwärmebelastung kleiner als oder gleich 70 kW

Chaudières de chauffage central utilisant les combustibles gazeux - Exigences spécifiques aux chaudières à condensation dont le débit calorifique nominal est inférieur ou égal à 70 kW

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English version

Gas-fired central heating boilers - Specific requirements for condensing boilers with a nominal heat input not exceeding 70 kW

Chaudières de chauffage central utilisant les combustibles gazeux - Exigences spécifiques aux chaudières à condensation dont le débit calorifique nominal est inférieur ou égal à 70 kW

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This European Standard was approved by CEN on 20 June 1996.

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.

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

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CONTENTS

	page
Foreword	3
1. Scope	3
2. Normative references	3
3. Definitions	4
3.1 condensing boiler	4
3.2 condensate	4
3.3 nominal condensing output	4
3.4 maximum allowable working temperature	4
4. Constructional requirements	4
4.1 Materials in contact with condensate	4
4.2 Removal of condensate	4
4.3 Control of the combustion products temperature	4
4.4 Chemical composition of the condensate	5
5. Operational requirements	5
5.1 General	5
5.2 Verification of the nominal condensing output	5
5.3 Formation of condensate	5
5.4 Temperature of combustion products	5
5.5 Combustion	5
5.5.1 Normal conditions	5
5.5.2 Special conditions	5
5.6 Efficiencies	5
5.6.1 Useful efficiency	5
5.6.2 Useful efficiency at part load	6
6. Test methods	6
6.1 General	6
6.2 Verification of the nominal condensing output	6
6.3 Formation of condensates	6
6.4 Temperature of combustion products	6
6.5 Combustion	7
6.5.1 Normal conditions	7
6.5.2 Special conditions	7
6.6 Efficiencies	7
6.6.1 Useful efficiency	7
6.6.2 Useful efficiency at part load	7
7. Marking	7
7.1 Data plate	7
7.2 Instructions	7
7.2.1 Technical instructions for the installer	7
7.2.2 Use and maintenance instructions for the user	8
Annex A (normative)	
Correction for the determined efficiency in the low water temperature test of condensing boilers.	8
Annex B (informative)	
Special national conditions	10
Annex C (informative)	
A-deviations	12
Annex ZA (informative)	
Clauses of this European standard addressing essential requirements or other provisions of EU Directives.	14

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SIST EN 677:1999

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 109 "Central heating boilers using gaseous fuels", the Secretariat of which is held by NNI.

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

This European Standard 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 standard.

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.

1. Scope

This European standard applies to gas-fired central heating boilers, which are declared by the manufacturer to be "condensing boilers":

- of types B (excluding appliances without a fan) and C,
- using one or more gases corresponding to the three gas families, and
- for which the nominal heat input is less than or equal to 70 kW.

This European standard only covers type testing.

This European standard completes or modifies the standards EN 297, prEN 483 and EN 625, hereafter called "boiler standards". It specifies supplementary requirements for condensing boilers.

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 297	Gas-fired central heating boilers - Type B ₁₁ and B _{11BS} boilers fitted with atmospheric burners of nominal heat input not exceeding 70 kW
EN 437	Test gases - Test pressures - Appliances categories
prEN 483: 1998	Gas-fired central heating boilers fitted - Type C boilers, fitted with atmospheric burners of nominal heat input not exceeding 70 kW
EN 625	Gas-fired central heating boilers - Specific requirements for the domestic hot water operation of combination boilers of nominal heat input not exceeding 70 kW

3. Definitions

For the purposes of this European standard, the definitions of the boiler standards and the following definitions apply:

3.1 condensing boiler

Boiler in which, under normal operating conditions and at certain operating water temperatures, the water vapour in the combustion products is partially condensed, in order to make use of the latent heat of this water vapour for heating purposes and which satisfies the efficiency requirements of this European standard.

3.2 condensate

Liquid formed from the combustion products during the condensation process.

3.3 nominal condensing output

The value of the useful output declared by the manufacturer, in kW, corresponding to the operation of the boiler in a 50 °C/30 °C water temperature regime.

3.4 maximum allowable working temperature

The temperature the material can withstand over a long period of time under working conditions.

4. Constructional requirements

4.1 Materials in contact with condensate

All parts of the heat exchanger(s) and other parts of the boiler likely to come into contact with condensate shall be constructed of sufficiently corrosion resistant materials or materials protected by a suitable coating in order to ensure a reasonable life for a boiler that is installed, used and maintained in accordance with the manufacturer's instructions.

4.2 Removal of condensate

Condensate produced during operation of the boiler, including condensate formed in the flue and its connecting pipes, shall be removed by means of a discharge pipe (or pipes).

The internal diameter of the outside connection of the condensate discharge system shall be at least 13 mm.

The disposal system, forming part of the boiler or supplied with the boiler, shall be such that:

- it can be easily inspected and cleaned in accordance with the manufacturer's instructions;
- it cannot transmit combustion products into the room where the boiler is installed; this requirement is satisfied if the disposal system incorporates a water trap;
- a water trap has a seal of at least 25 mm at the maximum pressure in the combustion chamber at the maximum flue length specified by the manufacturer.

Surfaces in contact with condensates (except purpose provided drains, water traps and siphons) shall be designed to prevent condensate retention.

[SIST EN 677:1999](#)

4.3 Control of the combustion products temperature

If the combustion products circuit contains materials that are likely to be affected by heat or is intended to be connected to a flue (including seals) that is likely to be affected by heat from the combustion products, the boiler shall incorporate a device to prevent the combustion products temperature exceeding the maximum allowable working temperature for the material as declared by the manufacturer.

The device for limiting the combustion products temperature shall be non-adjustable and shall not be accessible without tools.

If the flue gas system is not supplied with the appliance, the device for limiting the combustion products temperature may be supplied as an option to be fitted by the installer. Mounting of the device shall be well-defined.

4.4 Chemical composition of the condensate

If the manufacturer states the chemical composition of the condensate it shall be checked at the end of the test of 6.3.

5. Operational requirements**5.1 General**

In addition to the boilers standards EN 297, prEN483 and EN625 the following requirements apply as appropriate.

5.2 Verification of the nominal condensing output

If the manufacturer states the nominal condensing output it is verified under the test conditions of 6.2.

5.3 Formation of condensate

When the boiler is installed in accordance with the test conditions for efficiency measurement under 6.6.1, under the conditions of 6.3 condensate shall only form at the points intended for this purpose and shall be readily drained.

Condensate shall not find its way to parts of the boiler which are not intended for formation, collection and discharge of condensate, nor may the condensate cause any nuisance to the operation, the boiler and the surroundings.

5.4 Temperature of combustion products

If the boiler incorporates a device to limit the maximum temperature of combustion products, under the conditions of 6.4, the temperature of the combustion products shall not exceed the maximum allowable working temperature for the materials of the combustion circuit and the flue materials, specified by the boiler manufacturer.

Operation of the device shall cause non-volatile lock-out of the boiler.

5.5 Combustion**5.5.1 Normal conditions**

The combustion requirements are those specified in the boiler standards .

The still air tests shall also be carried out when the boiler is operating in the condensing mode (50 °C/30 °C).

5.5.2 Special conditions

Blockage of the condensate drain(s) or switching off the pump for the discharge of the condensate shall not lead to concentrations of CO in the combustion products > 0,2 % before shut-down or lock-out occurs. There shall be no spillage of condensate from the boiler.

5.6 Efficiencies

SIST EN 677:1999

5.6.1 Useful efficiency

Under the test conditions specified in 6.6.1, the useful efficiency at the nominal heat input (or the maximum heat input and at the arithmetic mean of the maximum and the minimum heat input for range rated boilers), shall be at least:

$$91 + {}^{10}\log P \quad (\text{in percent})$$

where:

P is the nominal output. For range rated boilers, P is the maximum output respectively the arithmetic mean of the maximum and the minimum heat output as stated by the manufacturer, expressed in kilowatts (kW).

5.6.2 Useful efficiency at part load

Under the test conditions specified in 6.6.2, the useful efficiency at 30 % of the nominal heat input, (or the arithmetic mean of the maximum and the minimum heat input for range rated boilers shall be at least:

$$97 + {}^{10}\log P \quad (\text{in percent})$$

where:

P is the nominal output. For range rated boilers, P is the arithmetic mean of the maximum and the minimum heat output as stated by the manufacturer, expressed in kilowatts (kW).

6. Test methods**6.1 General**

All the tests are carried out under the conditions laid down in the boiler standards , unless otherwise stated.

If the actual test conditions differ from the reference conditions (20 °C, 70 % relative humidity, 1 013,25 mbar) and/or the return water temperature differs from the specified value, the correction formulae given in Annex A are used to correct the determined useful efficiency for tests of 6.2 and 6.6.2.

6.2 Verification of the nominal condensing output

For boilers using 2nd family gas, whether with or without another gas family, the tests are carried out with one of the corresponding 2nd family reference gases.

For boilers using only 3rd family gas, the tests are carried out with one of the corresponding 3rd family reference gases.

The water rate is adjusted so as to obtain a return water temperature of $(30 \pm 0,5)$ °C and a temperature difference between flow and return temperature of (20 ± 2) °C.

The efficiency is determined as stated in the boiler standards .

It is checked that the product of the efficiency determined and the nominal heat input (maximum heat input for range rated boilers) is no less than the nominal condensing output.

6.3 Formation of condensates

The boiler shall operate continuously for 4 h under the test conditions of 6.2.

It is verified that the requirement of 5.3 is fulfilled.

6.4 Temperature of combustion products

The boiler is installed as specified in the general test conditions of the boiler standards and supplied with one of the corresponding reference gases for the boiler category at the nominal heat input.

Type B boilers are connected to a 1 m test flue and type C boilers are fitted with the shortest ducts specified by the manufacturer.

The boiler thermostat is put out of operation.

Where fitted, the control to limit the temperature of combustion products remains in operation.

The temperature of the combustion products is progressively raised, either by increasing the gas rate or by another means which increases the temperature (e.g. removal of baffles) as specified by the manufacturer.

It is verified that the requirement of 5.4 is fulfilled.

6.5 Combustion

6.5.1 Normal conditions

The combustion characteristics are verified in accordance with the boiler standards under two water temperature regimes: 80 °C/60 °C and 50 °C/30 °C.

6.5.2 Special conditions

The boiler is operated continuously under the test conditions of 6.2. With the condensate drain blocked or with a built-in pump for the discharge of condensate placed out of operation, the concentration of CO in the combustion products is checked to fulfil the requirement 5.5.2 until shut-down or lock-out occurs.

6.6 Efficiencies

For boilers using 2nd family gas, whether with or without another gas family, the tests are carried out with one of the corresponding 2nd family reference gases.

For boilers using only 3rd family gas, the tests are carried out with one of the corresponding 3rd family reference gases.

6.6.1 Useful efficiency

The efficiency is determined at the nominal heat input for boilers without range rating. For range rating boilers the efficiency is determined at the maximum heat input and at the arithmetic mean of the maximum and minimum heat input.

The water rate is adjusted so as to obtain a return water temperature of $(60 \pm 1)^\circ\text{C}$ and a temperature difference between flow and return water temperature of $(20 \pm 2)^\circ\text{C}$.

The efficiency is determined as stated in the boiler standards .

It is checked that the determined efficiencies are no less than the requirements of 5.6.1.

6.6.2 Useful efficiency at part load

The useful efficiency at part load is determined at 30 % of the nominal heat input for boilers without range rating. For range rating boilers the efficiency is determined at 30 % of the arithmetic mean of the maximum and minimum heat input.

The useful efficiency at part load is determined under the test conditions of the boiler standards with a constant return water temperature of $(30 \pm 0,5)^\circ\text{C}$. For boilers using only 3rd family gases, 2,4 is added for this value.

It is checked that the requirements of 5.6.2 are met.

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7. Marking

7.1 Data plate

In addition to the information specified in the boiler standards , the term "condensing boiler" shall appear on the data plate and optionally the nominal condensing output (in kW).

7.2 Instructions

7.2.1 Technical instructions for the installer

In addition to the provisions mentioned in the boiler standards , the installation instructions shall include the following information:

- detailed specifications for the means of discharging the combustion products and the condensate. Attention shall be drawn to the necessity of avoiding horizontal runs in the flue gas duct and the condensate draining duct, furthermore the minimum slope for these ducts shall be indicated;
- for type C boilers, the measures to be taken to avoid continuous discharge of condensate from the terminal;