BRITISH STANDARD

BS EN
15417:2006

Gas-fired central heating boilers — Specific requirements for condensing boilers with a nominal heat input greater than 70 kW but not exceeding 1 000 kW

The European Standard EN 15417:2006 has the status of a British Standard

ICS 91.140.10

BSI
British Standards

National foreword

This British Standard is the official English language version of EN 15417:2006.

The UK participation in its preparation was entrusted to Technical Committee GSE/29, Gas-fired central heating boilers, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 17 and a back cover.

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 July 2006

ISBN 0 580 49015 7

Amendments issued since publication

Amd. No.	Date	Comments

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 15417

July 2006

ICS 91.140.10

English Version

Gas-fired central heating boilers - Specific requirements for condensing boilers with a nominal heat input greater than 70 kW but not exceeding 1000 kW

Chaudières de chauffage central utilisant les combustibles gazeux - Exigences spécifiques aux chaudières à condensation dont le débit calorifique nominal est supérieur à 70 kW mais inférieur ou égal à 1000 kW

Heizkessel für gasförmige Brennstoffe - Spezielle Anforderungen an Brennwert-Heizkessel mit einer Nennwärmebelastung größer als 70 kW aber gleich oder kleiner als 1000 kW

This European Standard was approved by CEN on 18 May 2006.

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Ref. No. EN 15417:2006: E

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Foreword

This document (EN 15417:2006) has been prepared by Technical Committee CEN/TC 109 "Central heating boilers using gaseous fuels", the Secretariat of which is held by NEN.

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 January 2007, and conflicting national standards shall be withdrawn at the latest by January 2007.

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

1 Scope

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

— of types C (excluding appliances without a fan) and B,

— using one or more gases corresponding to the three gas families, and

— for which the nominal heat input is greater than 70 kW but not exceeding 1 000 kW. This document only covers type testing.

This document completes or modifies the standards EN 656, EN 13836, and prEN 15420 hereafter called "boiler standards". It specifies supplementary requirements for condensing boilers.

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 656:1999, *Gas-fired central heating boilers — Type B boilers of nominal heat input exceeding 70 kW, but not exceeding 300 kW*

EN 13836:2006, *Gas-fired central heating boilers — Type B boilers of nominal heat input exceeding 300 kW, but not exceeding 1 000 kW*

prEN 15420:2006, *Gas-fired central heating boilers — Type C boilers of nominal heat input exceeding 70 kW, but not exceeding 1 000 kW*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 656:1999, EN 13836:2006 and the following apply.

3.1
condensate
liquid formed from the combustion products during the condensation process

4 Classification of boilers

4.1 Gases and categories

Gases and categories are in accordance with those given in the "boiler standards"

4.2 Classification according to the mode of evacuation of the combustion products

The classifications according to the mode of evacuation of combustion products are in accordance with those given in the "boiler standards".

4.3 Classification according to operating conditions[1]

4.3.1 Gas condensing boiler

A type of boiler designed to condense permanently a large part of the water vapour contained in the combustion gases

4.3.2 Standard boiler

A type of boiler for which the average water temperature can be restricted by design

5 Constructional requirements

5.1 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.

5.2 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 condensate (except purpose provided drains, water traps and siphons) shall be designed to prevent condensate retention.

5.3 Chemical composition of the condensate

The manufacturer shall communicate the probable chemical composition of the condensate (pH, heavy metals, etc.) if the composition is required by national regulations.

5.4 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.

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[1] These definitions are in accordance with 92/42/EEC, however in this document, definition 4.3.2 is limited to gas boilers.

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 boiler, the device for limiting the combustion products temperature may be supplied as an option to be fitted by the installer. Instructions for mounting of the device shall be well-defined.

6 Operational requirements

6.1 General

In addition to the requirements of the "boilers standards" the following shall apply as appropriate.

6.2 Verification of the nominal condensing output

If the manufacturer states the nominal condensing output it is verified under the test conditions of 7.2.

6.3 Formation of condensate

When the boiler is installed in accordance with the test conditions for efficiency measurement given in 7.2, and tested in accordance with 7.3, condensate shall only form at the points intended for this purpose and shall be readily drained.

The formation of condensate shall not impair the correct operation of the boiler.

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.

6.4 Temperature of combustion products

If the boiler incorporates a device to limit the maximum temperature of combustion products, under the conditions of 7.4, 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.

6.5 Combustion

The combustion requirements are those specified in the "boiler standards" The tests are carried out in accordance with 7.5.1.

The requirements of clause 6.5.9 of EN 656:1999 or EN 13836:2006, or clause 6.5.8 of prEN 15420:2006 as appropriate, shall be met. The tests are carried out in accordance with 7.5.2.

6.6 Useful efficiency

6.6.1 General

Efficiency shall be determined using a reference gas of the second or third family as stated in 7.6.

6.6.2 Useful at the nominal heat input

Under the test conditions specified in 7.6.2, the useful efficiency at the nominal heat input, (or the maximum and minimum heat inputs specified by the manufacturer for range rated boilers), shall be at least;

— Boilers ≤ 400 kW output ≥ $91+\log_{10} P_n$ %;

— Boilers > 400 kW output ≥ 93.6 %

where:

P_n is the nominal output expressed in kilowatts (kW).

6.6.3 Useful efficiency at part load

Under the test conditions specified in 7.6.3, the useful efficiency at 30 % of the nominal heat input shall be at least:

— Boilers ≤ 400 kW output ≥ $97 + \log_{10} P_n$ % ;

— Boilers > 400 kW output ≥ 99.6 %

where:

P_n is the nominal output expressed in kilowatts (kW).

7 Test methods

7.1 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 ambient 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 6.6.3.

7.2 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 ± 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 (the heat input(s) stated by the manufacturer for range rated boilers) is not less than the nominal condensing output(s) stated by the manufacturer.

7.3 Formation of condensate

The boiler is run continuously for 4 h under the test conditions of 7.2. It is verified that the requirement of 6.3 is fulfilled.

7.4 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 to 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 6.4 is fulfilled.

7.5 Combustion

7.5.1 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.

7.5.2 Condensate discharge blockage

The tests given in the "boiler standards" [clause 7.5.9 of EN 656:1999, or EN 13836:2006, or clause 7.5.8 of prEN 15420:2006, as appropriate] shall be carried out and it is checked that the corresponding requirements are met.

7.6 Useful efficiency

7.6.1 General

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

7.6.2 Useful efficiency at nominal heat input

The efficiency is determined at the nominal heat input for boilers without range rating. For range rated boilers the efficiency is determined at the maximum and minimum adjustable heat inputs specified by the manufacturer.

The water rate is adjusted so as to obtain a return water temperature of (60 ± 1) °C and a temperature difference between flow and return water temperature of (20 ± 2) °C.

The efficiency is determined as stated in the "boiler standards". It is checked that the determined efficiencies are not less than the requirements of 6.6.2.

7.6.3 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 rated boilers the efficiency is determined at 30 % of the maximum and minimum adjustable heat inputs specified by the manufacturer.

The useful efficiency at part load is determined under the test conditions of the "boiler standards" with a constant return water temperature of (30 ± 0,5) °C.

For boilers using only 3rd family gases, 2,4 percentage points is added for this value.

It is checked that the requirements of 6.6.3 are met.

8 Marking

8.1 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(s) (in kW).

8.2 Instructions

8.2.1 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;

— any advice or instructions thought appropriate for the installer;

— reference to the national and/or local regulations for the discharge of condensate, in particular instructions for the installation of the condensing boiler where a condensate neutralisation system is necessary.

8.2.2 Use and maintenance instructions for the user

In addition to the provisions mentioned in the particular specifications for the boiler concerned, the user's instructions shall include a brief description of the operation of the boiler. The instructions shall state that the condensate outlet(s) shall not be modified or blocked and will include instructions relating to the cleaning and servicing of any condensate neutralisation system providing that such a system is necessary.

Annex A
(normative)

Correction for the determined efficiency in the low water temperature test of condensing boilers[1)]

If the air humidity of the combustion air under the test conditions differs from the standard value, the determined efficiency in the low water temperature tests (return water temperature $T_{ret,st}$ = 30 °C) is corrected with:

$\Delta\eta_{cond,1} = 0{,}08\ (X_{air,st} - X_{air,m})$ [absolute value in percent]

where:

$\Delta\eta_{cond,1}$ is the correction of the measured useful efficiency for air humidity deviation from the reference value in percent;

$X_{air,m}$ is the air humidity of the combustion air under the test conditions in grams per kilogram of dry air:

$X_{air,st}$ is the air humidity of the combustion air under the reference conditions in grams per kilogram of dry air ($X_{air,st}$ = 10 g/kg).

If the return water temperature differs from the standard value for the low water temperature tests, the determined efficiency is corrected with:

$\Delta\eta_{cond,2} = 0{,}12\ (T_{ret,m} - T_{ret,st})$ [absolute value in percent]

where:

$\Delta\eta_{cond,2}$ is the correction of the measured useful efficiency for return temperature deviation from the reference value in percent;

$T_{ret,m}$ is the return water temperature under the test conditions in degrees Celsius;

$T_{ret,st}$ is the reference value for the return water temperature for the low water temperature tests (30 °C).

The total correction is thus:

$\eta_u = \eta_m + \Delta\eta_{cond,1} + \Delta\eta_{cond,2}$

where:

η_u is the useful efficiency under reference conditions in percent;

η_m is the measured useful efficiency in percent.

These corrections shall be applied for test conditions where

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1) The corrections in this annex are based on the results of Work Package 2 (Influence of ambient conditions) of the European project "Full and part load efficiency measurements for boilers", which is sponsored by the EC Bureau Communautaire de Référence.

$0 \leq X_{air,m} \leq 20$ g/kg dry air

and

$25 \leq T_{ret,m} \leq 35$ °C

Annex ZA
(informative)

Clauses of this European standard addressing essential requirements or other provisions of EU Directives.

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 90/396/EEC (Gas Appliance Directive) and EU Directive 92/42/EEC (Boiler Efficiency Directive).

Warning: other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this European standard.

The following clauses of this European standard are likely to support requirements of' the Gas Appliance Directive and the Boiler Efficiency Directive.

Compliance with these clauses of this European standard provides one means of conforming with the specific essential requirements of the Directive concerned and associated EFTA regulations.

Only relevant essential requirements are included in this table. All other requirements are already covered in the "boiler standards".

Table ZA.1 — Identification form on the compliance of EN 15417 with the essential requirements of the EU Directive 90/396/EEC on the approximation of the laws of Member States concerning gas appliances

Essential requirement	Object	Clause in the standard
1	ANNEX 1 of the Directive **GENERAL CONDITIONS**	
1.2	Marking and instructions Installation instructions User's instructions and maintenance instructions for the user	8.1 and 8.2 8.2.1 8.2.2
1.2.1	Information in the installation instructions Discharge of combustion products	8.2.1 8.2.1
1.2.2	Contents of the user's instructions and maintenance instructions	8.2.2
1.3	Equipment	Not applicable
2	Materials	
2.1	Characteristics	5.1
3	Design and construction	
3.1.2	Condensation	5.1, 5.2, 5.4
3.1.9	Failure of the safety devices combustion products temperature limiter (if fitted)	6.4
3.4.1	Flame stability	
3.5	Rational use of energy	6.6

Table ZA.2 — Identification form on the compliance of EN 15417 with the essential requirements of the EU Directive 92/42/EEC on the efficiency requirements for new hot water boilers fired with liquid or gaseous fuels

Relevant articles of the directive	Object	Clauses in the standard
1	Field of application	1
2	Definitions	3
3	Exclusions	Not applicable
4.3	Efficiency of living space boilers	Not applicable
5.1	Efficiency requirements	6.6
5.2	Verification methods	7.6

Bibligraphy

[1] EN 437: *Test gases — Test pressures — Appliance categories*

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