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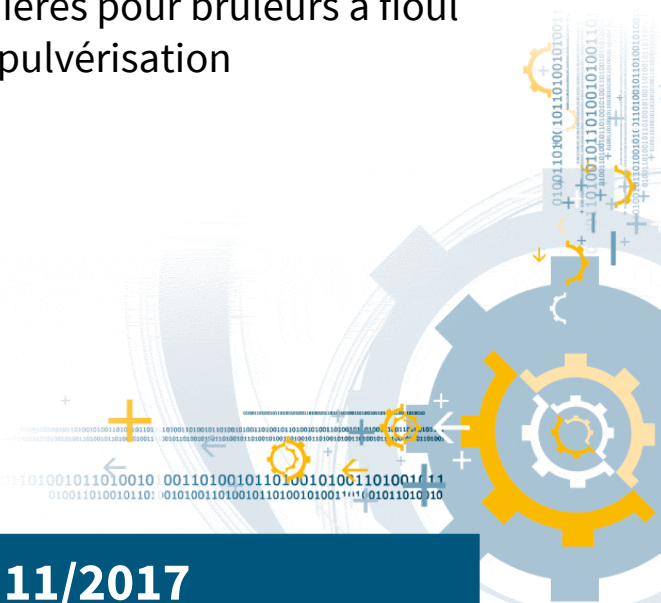
ILNAS-EN 304:2017

Heating boilers - Test code for heating boilers for atomizing oil burners

Heizkessel - Prüfregelein für Heizkessel mit
Ölzerstäubungsbrennern

Chaudières de chauffage - Règles d'essai
pour les chaudières pour brûleurs à fioul
à pulvérisation

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National Foreword

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Heating boilers - Test code for heating boilers for atomizing oil burners

Chaudières de chauffage - Règles d'essai pour les chaudières pour brûleurs à fioul à pulvérisation

Heizkessel - Prüfregeln für Heizkessel mit Ölzerstäubungsbrennern

This European Standard was approved by CEN on 2 July 2017.

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Contents

Page

European foreword.....	4
1 Scope	5
2 Normative references	5
3 Terms and definitions	5
4 General conditions for testing.....	5
5 Measurement accuracies and uncertainties	6
6 Measurements for the heating mode	7
6.1 General.....	7
6.2 Determination of the nominal heat output.....	7
6.3 Determination of the boiler efficiency at nominal heat output.....	7
6.4 Performance of testing.....	8
6.4.1 General test conditions	8
6.4.2 Draught adjustment	8
6.4.3 Establishment of steady-state conditions	8
6.4.4 Test period.....	8
6.5 Calculation	8
6.5.1 General.....	8
6.5.2 Nominal heat output	8
6.5.3 Boiler heat input.....	8
6.5.4 Boiler efficiency	9
6.6 Determination of the waterside resistance	9
6.7 Determination of the standby heat loss	10
6.7.1 General.....	10
6.7.2 Standby heat loss method 1.....	11
6.7.3 Standby heat loss method 2.....	12
6.8 Efficiency at 30 % of the nominal heat output.....	14
6.8.1 General.....	14
6.8.2 Efficiency at 30 % - Method 1 (time dependent method)	14
6.8.3 Efficiency at 30 % - Method 2 (load dependent method)	14
6.9 Auxiliary electricity consumption	15
6.10 Seasonal space heating efficiency	16
6.11 Verification of nominal condensing output.....	16
6.12 Formation of condensation	16
6.13 Functional test for the temperature sensing control type TR and temperature sensing control type STB on the boiler.....	16
6.14 Surface temperature	20
6.15 Floor temperatures	20
6.16 Limiting temperature of the test panels	20
6.17 Emission values of NO _x and CO	21
6.17.1 General.....	21
6.17.2 Units	21
6.17.3 Assemblies of a boiler with various burners	21
7 Measurement of the sanitary water production mode.....	21
8 Test report and other documents	22

Annex A (normative) Calculations for the heating mode	23
A.1 Volume measurement.....	23
A.2 Calculation of combustion parameters.....	23
A.3 Determination of air factor (λ) and excess air (e)	27
A.4 Test rigs.....	28
A.5 Calculation of the nominal heat output P_N.....	29
A.6 Calculation of the heat input.....	30
A.7 Calculation of efficiency	30
A.8 Calculation of the heat losses q_A, q_U, q_S.....	32
A.9 Standby heat loss (P_{Stby}).....	35
A.10 Calculation of the seasonal space heating energy efficiency	37
A.11 Fuel characteristics.....	38
Annex B (informative) Applicable symbols and units.....	40
Annex C (informative) Criteria for the adaptation of forced draught burners using liquid fuels to heating boilers	43
Annex D (informative) Information for setting up and evaluation of the test rig.....	45
Annex E (informative) Determination of the heat losses of the test rig.....	46
Annex ZA (informative) Relationship between this European Standard and the ecodesign requirements of Commission Regulation (EU) No [813/2013] aimed to be covered.....	47
Annex ZB (informative) Relationship between this European Standard and the ecodesign requirements of Commission Delegated Regulation (EU) No [811/2013] aimed to be covered	48
Bibliography	49

European foreword

This document (EN 304:2017) has been prepared by Technical Committee CEN/TC 57 “Central heating boilers”, the secretariat of which is held by DIN.

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 May 2018, and conflicting national standards shall be withdrawn at the latest by May 2018.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 304:1992 and EN 15034:2006.

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 Annexes ZA and ZB, which are an integral part of this document.

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1 Scope

This European Standard applies to the determination of the performances of heating boilers and combi boilers fired by liquid fuels. The requirements for the heating performances are laid down in EN 303-1:2017 and EN 303-2:2017.

This test code includes the requirements and recommendations for carrying out and evaluating the procedure for testing boilers and also the details of the technical conditions under which the tests will be carried out.

The requirements and the performance of testing for the sanitary hot water production of combi boilers are laid down in prEN 303-6.

2 Normative references

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

EN 267:2009+A1:2011, *Automatic forced draught burners for liquid fuels*

EN 303-1:2017, *Heating boilers - Part 1: Heating boilers with forced draught burners - Terminology, general requirements, testing and marking*

EN 303-2:2017, *Heating boilers - Part 2: Heating boilers with forced draught burners - Special requirements for boilers with atomizing oil burners*

prEN 303-6, *Heating boilers - Part 6: Heating boilers with forced draught burners - Specific requirements for the domestic hot water operation and energy performance of water heaters and combination boilers with atomizing oil burners of nominal heat input not exceeding 70 kW*

EN 15456, *Heating boilers - Electrical power consumption for heat generators - System boundaries - Measurements*

EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 303-1:2017 and EN 303-2:2017 and the following apply.

3.1

minimum continuous heat output

$P_{\min C}$

lowest heat output which is maintained automatically by the control device in continuous operation which is specified for each type of fuel in accordance with the requirements of this European Standard

4 General conditions for testing

The performance tests of the boiler shall be carried out by a test laboratory complying with the requirements of EN ISO/IEC 17025.

The test sample shall correspond to a boiler as placed on the market including all parts and accessories necessary for the operation of the boiler. Boilers to be equipped with different burners shall be tested with one specified forced draught burner.

The boiler and the burner shall be operated in accordance with the operation manual throughout all tests.

When determining the thermal outputs P_N and 30 % P_N of a combi boiler, no sanitary hot water shall be drawn off during the test. The thermal outputs shall be determined from the heating circuit only.

Sanitary hot water tests for combination boiler shall be done according to prEN 303-6.

5 Measurement accuracies and uncertainties

The accuracy of the measurement devices for the following parameters shall not exceed:

- a) Atmospheric pressure 50 Pa;
- b) Waterside pressure loss 2 % of measured value;
- c) Water flow rate 1 % of measured value;
- d) Air volume flow rate 2 % of measured value;
- e) Time
 - 1) up to 1 h: 0,2 s;
 - 2) beyond 1 h: 0,1 % of measured value
- f) Auxiliary electrical energy 2 % of measured value;
- g) Temperatures:
 - 1) Ambient 2 K;
 - 2) Water 1 K;
 - 3) Combustion products 2 K;
 - 4) Surface 2 K;
- h) CO, CO₂, O₂, NO_x, C_xH_y:
 - 1) CO₂-content: 0,1 % volume from full scale
 - 2) O₂-content: 0,1 % volume from full scale
 - 3) CO-content: 5 ml/m³
 - 4) NO_x-content: 5 ml/m³
 - 5) C_xH_y-content: 5 ml/m³
- i) Mass 0,05 % of the full scale;
- j) Pressure flue gas:
 - 1) ≤ 60 Pa: 1Pa;
 - 2) > 60 Pa: 2 % of the measured value.

The full range of the measuring apparatus shall be chosen in such a way that it is suitable for maximum anticipated value. The measurement accuracies indicated above concern individual measurements.

For measurements requiring a combination of individual measurements, the lower accuracies associated with individual measurements may be necessary to attain the total required uncertainty. The test rig shall be set up in such a way that the efficiency can be determined within a uncertainty of 2 % points.

6 Measurements for the heating mode

6.1 General

The amount of useful heat output transmitted to the heat carrier (water) is measured. It can be determined in the boiler circuit or by means of a secondary heat exchanger.

The useful heat output transmitted to the water is determined either by measuring

- a) the mass flow of cold water entering the boiler circuit and the rise of temperature between the outlet water temperature and the inlet water temperature; or
- b) the mass flow of the water circulating in the boiler circuit and its temperature rise; or
- c) the mass flow and the temperature rise over a secondary heat exchanger corrected by the heat loss of this secondary heat exchanger. The heat produced by the boiler is transferred to the cooling water by means of a secondary heat exchanger. The heat received by the latter is calculated from the mass flow and the temperature rise of the cooling water. The heat losses from the well-insulated connections between the boiler and the secondary heat exchanger and those of the secondary heat exchanger itself, are determined either by preliminary tests or by calculation. The heat output of the boiler is the sum of the two amounts of heat.

6.2 Determination of the nominal heat output

The tests for the determination of the nominal heat output shall be carried out at a firing rate such that the output is at least 100 %, but does not exceed 105 % of the nominal value, and the requirements concerning the nominal heat output shall be met.

If the heat output exceeds 105 %, a second test shall be carried out at a firing rate between 95 % and 100 % of the nominal heat output of the boiler.

The actual value for the nominal heat output shall be determined by linear interpolation between the two test results.

The nominal heat output shall be determined at a water rate that is adjusted to obtain a return water temperature of $(60 \pm 1) ^\circ\text{C}$ and a temperature difference between the flow and return water temperature of $(20 \pm 2) ^\circ\text{C}$.

NOTE The conditions for determination of the rated heat output in former versions of EN 304 have been a mean flow temperature of between $80 ^\circ\text{C}$ and $90 ^\circ\text{C}$, and the mean temperature difference between flow and return has been between 10 K and 25 K. However, this is not in line with the Regulation EU 813/2013.

6.3 Determination of the boiler efficiency at nominal heat output

The boiler efficiency at nominal heat output is measured as the determination of the nominal heat output (see 6.2).

The efficiency shall be determined on the basis of the net calorific value NCV.

The direct method according to 6.5.4.1 shall be applied. The indirect method allows an additional check of test accuracy of the test rig to be made by means of an energy balance.