SLOVENSKI STANDARD
SIST EN 15456:2008

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Kotli za gretje - Poraba elektrike v generatorjih toplote - Sistemske meje - Meritve

Heating boilers - Electrical power consumption for heat generators - System boundaries - Measurements

Heizkessel - Elektrische Leistungsaufnahme für Wärmeerzeuger - Systemgrenzen - Messungen

Chaudieres de chauffage - Consommation de puissance électrique des générateurs de chaleur - Limites du systeme - Mesurages

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English Version

Heating boilers - Electrical power consumption for heat generators - System boundaries - Measurements

Chaudières de chauffage - Puissance électrique des générateurs de chaleur - Limites du système - Mesurages

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Contents

Page

Foreword

This document (EN 15456:2008) 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of an identical text or by endorsement, at the latest by October 2008, and conflicting national standards shall be withdrawn at the latest by October 2008.

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Introduction

This document specifies the measurement methods for evaluating auxiliary power consumption. This document also provides the parameters for boilers necessary for the calculation of the total power consumption according to prEN 15316-4-1 [4].

1 Scope

This European Standard applies to heating boilers (e.g. with forced-draught burners (unit)) and burners equipped with a fan including all components specified by the manufacturer to be required for the designed boiler operation.

This European Standard also applies to heating boilers sold without burners.

This European Standard covers the required definitions, the system boundaries, the measurements for the determination of the electrical power consumption and, where applicable, the water side resistance in order to establish the electric auxiliary energy for:

— Oil-fired forced-draught burners in accordance with EN 267;

— Automatic forced-draught burners for gaseous fuels in accordance with EN 676;

— Flued oil stoves with vaporizing burners in accordance with EN 1;

— Heating boilers sold without burners for:

  — Oil-fired forced-draught burners in accordance with EN 303-1 [6], EN 303-2 [7] and EN 304;

— Condensing boilers for liquid fuels in accordance with EN 15034;

— Room sealed boilers for fuel oil in accordance with EN 15035;

— Heating boilers - Heating boilers with forced-draught burners - Nominal heat output not exceeding 10 MW and maximum operating temperature of 110 °C in accordance with EN 14394;

— Pellet burners for small heating boilers in accordance with EN 15270.

NOTE All measurements for boilers are carried out in the heating mode only. For hot water production this mode is also relevant.

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 1, *Flued oil stoves with vaporising burners*

EN 267, *Forced draught oil burners — Definitions, requirements, testing, marking*

EN 304:1992, *Heating boilers — Test code for heating boilers for atomizing oil burners*

EN 676, *Automatic forced draught burners for gaseous fuels*

EN 14394, *Heating boilers — Heating boilers with forced draught burners — Nominal heat output not exceeding 10 MW and maximum operating temperature of 110 °C*

EN 15034, *Heating boilers — Condensing heating boilers for fuel oil*

EN 15035, *Heating boilers — Special requirements for oil fired room sealed units up to 70 kW*

EN 15270, *Pellet burners for small heating boilers — Definitions, requirements, testing, marking*

3 Terms and definitions

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

3.1
reference conditions
15 °C and 1 013,25 mbar, unless otherwise stated

3.2
fuel mass flow
$\dot{m}_B$
fuel mass which is consumed during each unit of time by the boiler in continuous operation

NOTE Fuel mass flow is expressed in cubic metre per hour or kilogram per hour.

3.3
fuel volumetric flow
$\dot{V}_B$
volume of the fuel supplied to the boiler during continuous operation for each unit of time

NOTE Fuel volumetric flow is expressed in cubic metre per hour.

3.4
electrical power consumption

P_{aux}

3.4.1
electrical power consumption for heat generation
$P_{aux,gen}$
electric energy consumed by the system components (e.g. pump, fan, valves and control unit) required for the heat generator‘s designed operation:

— at full load (100 %) $P_{aux\ 100}$,

— at part load (30 %) $P_{aux\ 30}$ and

— at stand-by operation $P_{aux\ sb}$.

NOTE Electrical power consumption for heat generation is expressed in watts.

3.4.2
electrical power consumption for other use
$P_{aux,\ dis}$
electric energy consumed by the system components which are not required for the heat generator‘s designed operation, e.g. heat distribution pump, valves for heat distribution

NOTE Electrical power consumption for other use is expressed in watts.

3.5
draught
pressure differential between the static air pressure in the place of installation and the static pressure of the exhaust gases, as measured in the exhaust gas measuring section, which is required for correct operation of the boiler in the test room

3.6
calorific value
quantity of heat produced by the complete combustion, at a constant pressure equal to 1 013,25 mbar, of a unit volume or mass of gas or oil, the constituents of the combustible mixture being taken at reference conditions and the products of combustion being brought back to the same conditions

A distinction is made between:

— gross calorific value H_s the water produced by combustion is assumed to be condensed;

— net calorific value H_i the water produced by combustion is assumed to be in the vapour state.

NOTE The calorific value is expressed:

— either in mega joules per cubic metre (MJ/m³) of dry gas under the reference conditions;

— or in mega joules per kilogram (MJ/kg) of dry gas;

[EN 437:2003 [3]]

— or in mega joules per kilogram (MJ/kg) of oil.

3.7
nominal heat input
P_N
maximal value of heat input for the heating mode declared by the manufacturer

NOTE Nominal heat input is expressed in kilowatts.

3.8
nominal heat output
Φ_N
maximal value of heat output declared by the manufacturer

NOTE Nominal heat output is expressed in kilowatts.

3.9
test room
room in which the heat generator has been installed during the measurement in which the ambient parameters corresponding to the reference conditions are found

3.10
residual pump head
h_R
available pump head after deduction of the hydraulic resistance of the boiler

NOTE Residual pump heat is expressed in metre.

3.11
stand-by operation
operating mode without any heat demand, the system immediately starts up in the required mode as soon as there will be a heat demand

3.12
temperature spread
temperature difference between flow and return connection of the heat generator

3.13
unit
assembly of a boiler and a forced-draught burner, offered as a factory-assembled unit

3.14
heat input
P
product of the volumetric flow or mass flow and the net or gross calorific value of the fuel referred to the same reference conditions:

$$P_{\mathrm{N,Hi}} = \dot{V}_{\mathrm{B}} \cdot H_{\mathrm{i}}\text{, or } P_{\mathrm{N,Hs}} = \dot{V}_{\mathrm{B}} \cdot H_{\mathrm{s}} \qquad (1)$$

or

$$P_{\mathrm{N,Hi}} = \dot{m}_{\mathrm{B}} \cdot H_{\mathrm{i}}\text{, or } P_{\mathrm{N,Hs}} = \dot{m}_{\mathrm{B}} \cdot H_{\mathrm{s}} \qquad (2)$$

NOTE Heat input is expressed in kilowatts.

3.15
water side resistance
h_{i}
pressure loss across the boiler measured between the flow and return connection of the boiler, with a volume flow corresponding to the nominal heat output

NOTE Water side resistance is expressed in metres.

3.16
circulator (pump)

3.16.1
circulator (pump) for heat generation
device required for the heat generator's designed operation

3.16.2
circulator (pump) for heating distribution
device required for the distribution of the generated heat in the heating system (pipes, radiators)

NOTE In some cases a single circulator (pump) can be used for heat generation and for heating distribution.

4 System boundaries for measurements

4.1 General

Boilers are sold with heat generation pumps, with heat generation as well as heat distribution pumps or without any pump. For the purpose of this European Standard, the following system boundaries shall be used accordingly.

4.2 System with circulator (pump) for heat generation

The system boundary starts at the manual shut-off device (for water and fuel) and ends at the flue outlet of the heating boiler or of the test flame tube for burners. The energy consumption of the burner for testing heating boilers sold without burners shall not be taken into account.

The following components shall be part of the heating boiler and also covered by measurement provided they are required for the designed operation:

— shut-off valves in the fuel supply;

— integrated fuel supply (pump);

— integrated oil pre-heater;

— supply of combustion air (air fan), respectively flue gas removal (flue exhauster);

— control and monitoring devices (programming units, monitoring device/detector, etc.);

— regulating devices with a complete equipment offered sometimes even as an option;

— circulator (pump) for heat generation.

NOTE If the circulator (pump) is used for heat generation and for heating distribution the pump has to be measured separately according to 4.3.

4.3 System with a single circulator (pump) for heat generation and heat distribution

In addition to 4.2 the components which are not required for the heat generation; e.g. heat distribution circulator (pump), valves for heat distribution shall be measured and stated separately.

4.4 System without any circulator (pump)

According to 4.2 without any circulator (pump).

4.5 Burner

The following components shall be part of the forced-draught burner and also covered by measurement provided they are required for the designed operation:

— shut-off valves in the fuel supply;

— integrated fuel supply (pump);

— integrated oil pre-heater;

— supply of combustion air (air fan);

— control and monitoring devices (programming units, monitoring/detector, etc.).

5 Measurement

5.1 Heating boiler

5.1.1 Setting of the heating boiler

For the measurements, at least two different input points corresponding to the nominal heat input P_N at full load 100 % and at part load 30 % as well as at stand-by operation of the heating boiler shall be taken as a basis to determine the respective values with respect to the required electrical power consumption P_{aux}.

All measurements shall be carried out in the heating mode. The test shall be carried out in accordance with the requirements of the efficiency measurement of the relevant appliance standard.

The measurements shall be carried out with a spread of (20 ± 2) K between flow and return at nominal heat input.

Before starting with the measurement, the boiler shall be set in accordance with the manufacturer's instructions. The measurements shall be carried out in accordance with the requirements for the type test of the respective appliance standard.