SLOVENSKI STANDARD
oSIST prEN 15502-2-3:2021

01-julij-2021

Plinski kotli za centralno ogrevanje - 2-3. del: Poseben standard za hibridne naprave za ogrevanje prostorov, pri katerih je v enem izdelku plinski kotel kombiniran s toplotno črpalko

Gas-fired central heating boilers - Part 2-3: Specific standard for hybrid space heating appliances combining a gas fired appliances and heat pump in a product

Gasbefeuerte Zentralheizungskessel - Teil 2-3: Spezifische Norm für Hybrid-Raumheizgeräte, die gasbefeuerte Geräte mit Wärmepumpen in einem Produkt kombinieren

Ta slovenski standard je istoveten z: **prEN 15502-2-3**

ICS:

27.060.30	Grelniki vode in prenosniki toplote	Boilers and heat exchangers
91.140.10	Sistemi centralnega ogrevanja	Central heating systems
97.100.20	Plinski grelniki	Gas heaters

oSIST prEN 15502-2-3:2021 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 15502-2-3

June 2021

ICS 27.060.30; 91.140.10

English Version

Gas-fired central heating boilers - Part 2-3: Specific standard for hybrid space heating appliances combining a gas fired appliances and heat pump in a product

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 109.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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This document (prEN 15502-2-3:2021) has been prepared by Technical Committee CEN/TC 109 “Central heating boilers using gaseous fuels”, the secretariat of which is held by NEN.

This document is currently submitted to the CEN Enquiry.

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, ZB, ZC and ZD, which are an integral part of this document.

Introduction

Hybrid heat pump using gas as fossil energy (called “hybrid unit” into the present document) intends to combine renewable source heat generators and gas fired heat generators. Most of these renewable sources have a climate dependent efficiency and capacity, such as air to water heat pumps relying on the inlet air conditions. Therefore, the seasonal efficiency of hybrid unit cannot be assessed like gas fired heaters where the climate effect on efficiency is not noticeable.

Hybrid unit using gas as fossil energy cannot be considered as a heat pump nor fully as a gas fired appliance.

The standard rating conditions and methods are given in the FprEN 15502-1:2021 and EN 15502-2-1:2012+A1:2016 for gas fired appliance and EN 14511-2:2018 and EN 14511-3:2018 for heat pumps.

The present document deals with safety aspects especially coming from coexistence of gas and refrigerant fluid.

The present document provides a method to define the seasonal efficiency of the hybrid units. The method is based on set of part load conditions in different climatic conditions weighted to represent the space heating demand over a year.

1 Scope

This document specifies, the requirements and tests methods concerning, in particular, the construction, safety, fitness for purpose, and rational use of energy, as well as the classification and marking of hybrid products.

The hybrid product is composed by:

— a gas boiler as heat generator which could supply the heat demand in all operating conditions;

— an electrical heat pump, as heat generator, which has not to fulfil the heat demand in all operating conditions;

— a control unit (see definition 3.1.10).

The gas boiler as part of the hybrid product covered by this document is a gas-fired central heating boilers from the types C_1 up to C_9 and the types B_2, B_3 and B_5, according to the classification in EN 1749:2020:

a) that have a nominal heat input (on the basis of gross calorific value) not exceeding 400 kW;

b) that use one or more combustible gases of the three gas families at the pressures stated in EN 437;

c) where the temperature of the heat transfer fluid does not exceed 105 °C during normal operation;

d) where the maximum operating pressure in the water circuit does not exceed 6 bar;

e) which shall be classified as gas boiler;

f) which are intended to be installed either indoors or outdoors in a partially protected place;

g) which may include the facility to produce hot water, either by the instantaneous or storage principle, the whole being marketed as a single unit;

h) which are designed for either sealed water systems or for open water systems.

This document provides requirements for boilers with known constructions. For boilers with any alternative constructions, which might not fully be covered by this document, the risk associated with this alternative construction needs to be assessed.

An example of an assessment methodology, based upon risk assessment and which covers the essential requirements of the Gas Appliance Regulation UE/426/2016, is given in Clause 11.

This document does not cover all the requirements for:

Appliances that are intended to be connected to gas grids where the quality of the distributed gas is likely to vary to a large extent over the lifetime of the appliance (see FprEN 15502-1:2021, Annex DD);

a) appliances using flue dampers;

b) appliances of the types B_{21}, B_{31}, B_{51}, C_{21}, C_{41}, C_{51}, C_{61}, C_{71} and C_{81};

c) appliances incorporating flexible plastic flue liners;

d) appliances designed to become connected to a combined flue duct system that is designed to operate under overpressure (for example C_a)).

This document specifies minimum operating requirements which ensure that the products are fit for the use designated by the manufacturer when used for space heating and/or DHW production.

This part specifies the common requirements and test methods concerning, in particular the construction, safety, fitness for purpose, and rational use of energy.

This document is to be used in conjunction with:

a) the gas fired boiler, the generic part EN 15502-1 and specific Part 2-1 and Part 2-2;

b) the electrical heat pump, EN 14511-4:2018, EN 378-1:2016+A1:2020 to EN 378-4:2016+A1:2019 and FprEN 14825:2020;

c) electrical safety, EN 60335-1:2019, EN 60335-2-102:2016, EN 60335-2-40:2003, EN 60335-2-40:2003/A13:2012 and EN 60204-1;

d) for domestic hot water production, EN 13203-5.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 378-1:2016+A1:2020, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 1: Basic requirements, definitions, classification and selection criteria*

EN 378-2:2016, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 2: Design, construction, testing, marking and documentation*

EN 378-4:2016+A1:2019, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 4: Operation, maintenance, repair and recovery*

EN 12102-1:2017, *Air conditioners, liquid chilling packages, heat pumps, process chillers and dehumidifiers with electrically driven compressors — Determination of the sound power level — Part 1: Air conditioners, liquid chilling packages, heat pumps for space heating and cooling, dehumidifiers and process chillers*

EN 14511-1:2018, *Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors — Part 1: Terms and definitions*

EN 14511-3:2018, *Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors — Part 3: Tests methods*

EN 14511-4:2018, *Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors — Part 4: Requirements*

prEN 14825:2020, *Air conditioners, liquid chilling packages and heat pumps, with electrically driven compressors, for space heating and cooling — Testing and rating at part load conditions and calculation of seasonal perform*

FprEN 15502-1:2021, *Gas-fired central heating boilers — Part 1: General requirements and tests*

EN 15502-2-1:2012+A1:2016, *Gas-fired central heating boilers — Part 2-1: Specific standard for type C appliances and type B_2, B_3 and B_5 appliances of a nominal heat input not exceeding 1 000 kW*

EN 15502-2-2:2014, *Gas-fired central heating boilers — Part 2-2: Specific standard for type B_1 appliances*

EN 60335-2-40:2003, *Household and similar electrical appliances — Safety — Part 2: Particular requirements for electrical heat pumps*

EN 60335-2-40:2003/A13:2009, *Flammable refrigerants*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in FprEN 15502-1:2021, EN 15502-2-1:2012+A1:2016, EN 15502-2-2:2014, EN 14511-1:2018, EN 378-1:2016+A1:2020 to EN 378-4:2016+A1:2019, prEN 14825:2020 and the following apply.

3.1.1
climatic season
set of operating conditions describing per bin the combination of outdoor temperatures and the number of hours these temperatures occur for heating for which the unit is declared fit for purpose

Note 1 to entry: There are three reference heating seasons: “A” average, “C” colder and “W” warmer.

3.1.2
hybrid product
encased assembly or assemblies designed as a complete unit consisting of the combination of an electrically driven heat pump and a gas fired heat generator, managed by a common controller providing an optimized operation of the unit for space heating

Note 1 to entry: The hybrid products may also provide domestic hot water and/or space cooling.

3.1.3
product
product placed on the market as a one reference. It could be a one or several packages of one or casings

3.1.4
design load
P_{design}
space cooling ($P_{designc}$) or space heating ($P_{designh}$) load declared by the manufacturer at $T_{designc}$ or $T_{designh}$ conditions respectively

Note 1 to entry: It is possible to calculate the SEER/$SEER_{on}$ or SCOP/$SCOP_{on}$/$SCOP_{net}$ of a unit for more than one P_{design} value.

Note 2 to entry: Expressed in kW.

[Source: prEN 14825:2020, 3.1.43]

3.1.5
reference design conditions for space heating
$T_{designh}$
temperature conditions for average, colder and warmer climates

[Source: prEN 14825:2020, 3.1.73]

3.1.6
very high temperature application
application where the gas boiler delivers its declared heating capacity at water outlet temperature of 80 °C, at standard conditions given by 8.4.4 of prEN 15502-2-1:2020

3.1.7
flammable refrigerant
refrigerant with a classification of class A2 or A3 in compliance with ANSI/ASHRAE 34-2001 (ISO 817) classification

3.1.8
refrigerating system
combination of interconnected refrigerant containing parts constituting one closed refrigerant circuit in which refrigerant is circulated for the purpose of extracting heat at the low temperature side to reject heat at the high temperature side by changing the state of the refrigerant

3.1.9
switch temperature boiler off
$T_{fb,off}$

for a hybrid unit, minimum outdoor air temperature at which the fossil fuel boiler is not providing any heating capacity as it is switched off by the controls and heat is only provided by the heat pump

Note 1 to entry: $T_{fb,off}$ is used in place of T_{biv} which is not relevant for hybrid units

[Source: prEN 14825:2020, 3.1.85]

3.1.10
control unit
device part of the unit which optimises the operation of the heat generators in terms of use of renewable source and space heating seasonnal efficiency

Note 1 to entry: Controls may be based, for example, on primary energy optimization, cost optimization, net balancing, availability of renewable source, …

3.2 Symbols

Shall be according to FprEN 15502-1:2021, 3.2 with the following addition:

"prEN 14825:2020, Table 1 (or extracted) applies.".

4 Classification

Shall be according to FprEN 15502-1:2021, Clause 4.

5 Construction

5.1 General

Shall be according to EN 15502-2-1:2012+A1:2016, Clause 5, for boilers, with the following addition for the heat pumps, as follows:

"The heat pump shall be according to the construction requirements of EN 378-2:2016, Clause 6.".

5.2 Conversion to different gases

Shall be according to FprEN 15502-1:2021, 5.2.

5.3 Materials

Shall be according to FprEN 15502-1:2021, 5.3, with the following addition:

"Shall be according to EN 15502-2-1:2012+A1:2016, 5.3.1 (for boilers) as well as EN 378-2:2016, 5.3.1 (for heat pumps) with the following considerations.

Special care should be taken regarding material suitability for the temperature range. Some components may be subject to a wider range of temperature conditions due to proximity of heat pump elements and boiler elements.

Special care should be taken regarding possible exposure of heat pump element to flue gases or condensate. All parts likely to come into contact with flue gases or combustion condensate shall be constructed of sufficiently corrosion resistant materials or materials protected by a suitable coating in order to ensure a reasonable life for an appliance that is installed, used and maintained in accordance with the manufacturer's instructions.

If combustion condensate, due to air in contact with cold part of the hybrid gas boiler, takes place inside the casing, this shall not:

a) affect the operational safety and the integrity of materials;

b) drop outside the hybrid gas boilers.

In case of such combustion condensate, a disposal system shall be adopted.".

5.4 Method of construction

Shall be according to FprEN 15502-1:2021, 5.4, with the following addition at 5.4.4 "Connections to air and flue duct", for heat pumps, as follows:

"Heat pump air input shall be placed in a position preventing any re-entry of cold output air from the heat pump. This shall be detailed in the technical documentation.".

And with the following addition:

"**5.4.5.3 Soundness of the refrigerant circuit**

Any leakage of the refrigerant fluid shall not create dangerous situation for people or damage part of the machine. The combustion of the leaked refrigerant gas shall be avoided or thoroughly assessed in the risk analysis.".

5.5 Burners

Shall be according to FprEN 15502-1:2021, 5.5.

5.6 Pressure test points

Shall be according to FprEN 15502-1:2021, 5.6.

5.7 Requirements for the application of control and safety devices

Shall be according to EN 15502-2-1:2012+A1:2016, 5.7.

6 Electrical and electromagnetic safety

Shall be according to FprEN 15502-1:2021, Clause 6, *for boilers, with the following addition for electrical heat pumps:*

"Shall be according to EN 60335-2-40, for the electrical heat pumps, with the following specific conditions:

— EN 60335-2-40:2003, Clause 21.2, applies: the transport tests shall be only performed on the packaging where the refrigerant system is included;

— EN 60335-2-40:2003, Annex NN (Clause 22.117.3): in case of usage of flammable refrigerant safety measures shall be implemented to cut off the appliance in case of refrigerant leakage without possibility of automatic re-start.".

7 Controls

Shall be according to FprEN 15502-1:2021, Clause 7 and *EN 15502-2-1:2012+A1:2016, 7.1, with the following new subclause 7.4 as follows:*

"7.4 Optimization of primary energy consumption

Controls shall be designed to optimize the seasonal primary energy consumption (see Figure 1).

Controls shall monitor both efficiency of the gas boiler and the heat pump to select the optimum hybrid unit operational mode.

The operational modes are defined as follows as given in Figure 1:

— Zone A: the efficiency of the heat pump is greater than the efficiency of the boiler and the output of the heat pump is sufficient to cover the heat demand. The heat pump is used alone.

— Zone B: the efficiency of the heat pump is greater than the efficiency of the boiler and the output of the heat pump is not sufficient to cover the heat demand. The heat pump and the boiler are used together.

— Zone C: the efficiency of the boiler is greater than the efficiency of the heat pump. The boiler is used alone.