



SLOVENSKI STANDARD

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Ogrevalni sistemi v stavbah - Metoda za preračun energijskih zahtev in učinkovitosti sistema - 4-8. del: Sistemi za ogrevanje prostora, ogrevanje zraka in sistemi stropnih seval

Heating systems in buildings - Method for calculation of system energy requirements and system efficiencies - Part 4-8: Space heating generation systems, air heating and overhead radiant heating systems

Heizungsanlagen in Gebäuden - Verfahren zur Berechnung des Endenergiebedarfs und des Nutzungsgrades von Anlagen - Teil 4-8: Wärmeezeugung von Warmluft- und Strahlungsheizsystemen

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Heating systems in buildings - Method for calculation of system energy requirements and system efficiencies - Part 4-8: Space heating generation systems, air heating and overhead radiant heating systems

Systèmes de chauffage dans les bâtiments - Méthode de calcul des besoins énergétiques et des rendements des systèmes - Partie 4-8: Systèmes de génération de chauffage des locaux, systèmes de chauffage par air chaud et par rayonnement

Heizungsanlagen in Gebäuden - Verfahren zur Berechnung des Endenergiebedarfs und des Nutzungsgrades von Anlagen - Teil 4-8: Wärmeerzeugung von Warmluft- und Strahlungsheizsystemen

This European Standard was approved by CEN on 9 January 2011.

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EN 15316-4-8:2011 (E)**Foreword**

This document (EN 15316-4-8:2011) has been prepared by Technical Committee CEN/TC 228 "Heating systems in buildings", 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of an identical text or by endorsement, at the latest by August 2011, and conflicting national standards shall be withdrawn at the latest by August 2011.

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

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Introduction

This European Standard presents methods for calculation of the additional energy requirements of a heat generation system in order to meet the building demand. The calculation is based on the performance characteristics of the products given in product standards and on other characteristics required to evaluate the performance of the products as included in the system.

This method can be used for the following applications:

- judging compliance with regulations expressed in terms of energy targets;
- optimisation of the energy performance of a planned heat generation system, by applying the method to several possible options;
- assessing the effect of possible energy conservation measures on an existing heat generation system, by calculating the energy use with and without the energy conservation measure.

The user should refer to other European Standards or to national documents for input data and detailed calculation procedures not provided by this standard.

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EN 15316-4-8:2011 (E)**1 Scope**

This European Standard is part of a series of standards on the method for calculation of system energy requirements and system efficiencies.

The scope of this specific part is to standardise the:

- required inputs;
- calculation method;
- resulting outputs

for space heating generation by:

- a) air heating systems, including control, and
- b) overhead radiant heating systems for non-domestic use , including control.

This European Standard does not apply to air heating systems that utilise water as a heat transfer medium.

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 416-1, *Single burner gas-fired overhead radiant tube heaters for non-domestic use — Part 1: Safety*

EN 419-1, *Non-domestic gas-fired overhead luminous radiant heaters — Part 1: Safety*

EN 621, *Non-domestic gas-fired forced convection air heaters for space heating not exceeding a net heat input of 300 kW, without a fan to assist transportation of combustion air and/or combustion products*

EN 777-1, *Multi-burner gas-fired overhead radiant tube heater systems for non-domestic use — Part 1: System D - Safety*

EN 777-2, *Multi-burner gas-fired overhead radiant tube heater systems for non-domestic use — Part 2: System E - Safety*

EN 777-3, *Multi-burner gas-fired overhead radiant tube heater systems for non domestic use — Part 3: System F - Safety*

EN 777-4, *Multi-burner gas-fired overhead radiant tube heater systems for non-domestic use — Part 4: System H - Safety*

EN 778, *Domestic gas-fired forced convection air heaters for space heating not exceeding a net heat input of 70 kW, without a fan to assist transportation of combustion air and/or combustion products*

EN 1020, *Non-domestic forced convection gas-fired air heaters for space heating not exceeding a net heat input of 300 kW, incorporating a fan to assist transportation of combustion air or combustion products*

EN 1196, *Domestic and non-domestic gas-fired air heaters — Supplementary requirements for condensing air heaters*

EN 1319, *Domestic gas-fired forced convection air heaters for space heating, with fan-assisted burners not exceeding a net heat input of 70 kW*

EN 13410, *Gas-fired overhead radiant heaters — Ventilation requirements for non-domestic premises*

EN 15316-2-1, *Heating systems in buildings — Method for calculation of system energy requirements and system efficiencies — Part 2-1: Space heating emission systems*

EN 15316-2-3, *Heating systems in buildings — Method for calculation of system energy requirements and system efficiencies — Part 2-3: Space heating distribution systems*

EN 15316-4-1:2008, *Heating systems in buildings — Method for calculation of system energy requirements and system efficiencies — Part 4-1: Space heating generation systems, combustion systems (boilers)*

EN ISO 7345:1995, *Thermal insulation — Physical quantities and definitions (ISO 7345:1987)*

EN ISO 13790, *Energy performance of buildings — Calculation of energy use for space heating and cooling (ISO 13790:2008)*

3 Terms, definitions, symbols and units

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 7345:1995 and the following apply.

3.1.1 air heating system

heating system composed of one or more individual forced convection air heating appliances

3.1.2 auxiliary energy

electrical energy used by technical building systems for heating, cooling, ventilation and /or domestic water to support energy transformation to satisfy energy needs

NOTE 1 This includes energy for fans, pumps, electronics, etc.

NOTE 2 Adapted from EN 15316-1:2007.

3.1.3 calculation period

time period over which the calculation is performed

NOTE The calculation period can be divided into a number of calculation steps.

[EN 15316-1:2007]

3.1.4 combustion power

product of the fuel flow rate and the net caloric value of the fuel

3.1.5 condensing air heater

air heater designed to make use of the latent heat released by condensation of water vapour in the combustion flue products

NOTE The heater will allow the condensate to leave the heat exchanger in liquid form by way of a condensate drain.

3.1.6 energy need for heating or cooling

energy to be delivered to or extracted from a conditioned space to maintain the intended temperature conditions during a given period of time

EN 15316-4-8:2011 (E)**3.1.7****energy use for space heating**

energy input to the heating system to satisfy the energy need for heating

3.1.8**forced convection air heater**

appliance designed to provide space heating from a central source by distributing heated air, by means of an air moving device, either through ducting or directly into the heated space

3.1.9**flued heater**

heating appliance of type B or C, connected to a flue or a device for evacuating the products of combustion to the outside of the room in which the appliance is installed

3.1.10**gross calorific value**

quantity of heat released by a unit quantity of fuel, when it is burned completely with oxygen at a constant pressure equal to 101 320 Pa, and when the products of combustion are returned to ambient temperature

NOTE 1 This quantity includes the latent heat of condensation of any water vapour contained in the fuel and of the water vapour formed by the combustion of any hydrogen contained in the fuel.

NOTE 2 Adapted from EN 15316-4-7:2008.

3.1.11**high-low appliance**

appliance capable of operating either at its nominal fuel heat input or at a fixed reduced heat input

3.1.12**heated space**

room or enclosure which, for the purposes of the calculation, is assumed to be heated to a given set-point temperature or set point temperatures, and whose total volume can be split up into several heating zones

3.1.13**heating system thermal loss**

thermal loss from a technical building system for heating that does not contribute to the useful output of the system

NOTE Thermal energy recovered directly in the subsystem is not considered as a system thermal loss but as heat recovery and directly treated in the related system standard.

3.1.14**load factor**

ratio between the time the burner is on and the total time the generation system is available to supply heat as demanded by system controls

3.1.15**modes of operation**

various modes in which the heating system can operate (set-point mode, cut-off mode, reduced mode, set-back mode, boost mode)

[EN 15316-4-7:2008]

3.1.16**modulating appliance**

appliance capable of varying its heat input in a continuous manner between the nominal fuel heat input and a minimum value, whilst maintaining continuous burner firing

3.1.17**multi-burner overhead radiant tube system**

radiant tube heater system which employs two or more burner units with each unit incorporating independent flame monitoring

NOTE The units may be located in one or more sections of tubing. One or more fans may be used to assist in the evacuation of products of combustion or the supply of combustion air.

3.1.18**net calorific value**

gross calorific value minus condensation latent heat of the water vapour in the products of combustion at ambient temperature

3.1.19**on/off appliance**

appliance without the capability to vary the fuel burning rate whilst maintaining continuous burner firing

NOTE This includes appliances with alternative burning rates set once only at the time of installation, referred to as range rating.

3.1.20**overhead radiant heating system**

heating system composed of one or more individual overhead radiant heating appliances

3.1.21**overhead radiant luminous heater**

appliance intended for installation at a height above head level which is designed to heat the space beneath by radiation and in which the heat is produced by means of burning the fuel at or near the outer surface of a material such as a ceramic plaque or gauze, or by means of an atmospheric burner heating a gauze or similar material

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3.1.22**overhead radiant tube heater**

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appliance intended for installation above head level which is designed to heat the space beneath by radiation by means of a tube or tubes, heated by the internal passage of combustion products

3.1.23**recoverable system thermal loss**

part of a system thermal loss which can be recovered to lower either the energy need for heating or cooling or the energy use of the heating or cooling system

NOTE Adapted from EN 15316-4-1:2008.

3.1.24**recovered system thermal loss**

part of the recoverable system thermal loss which has been recovered to lower either the energy need for heating or cooling or the energy use of the heating or cooling system

NOTE Adapted from EN 15316-4-1:2008.

3.1.25**space heating**

process of heat supply for thermal comfort

3.1.26**thermal zone**

part of the heated space with a given set-point temperature, throughout which the internal temperature is assumed to have negligible spatial variation

EN 15316-4-8:2011 (E)**3.1.27****total heating system thermal loss**

total of the heating system thermal losses, including recoverable thermal losses

3.1.28**type A appliance**

appliance not intended for connection to a flue or to a device for evacuation the products of combustion directly to the outside of the room in which the appliance is installed

3.1.29**unflued heater**

heating appliance of type A, not connected to a flue

3.1.30**ventilation**

process of supplying or removing air by natural or mechanical means to or from a space

3.2 Symbols and units

For the purposes of this document, the following symbols and units (Table 1) and indices (Table 2) apply:

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Table 1 — Symbols and units

| Symbol | Name of quantity | Unit |
|----------|--|----------------------|
| α | heat loss factor | – |
| β | load factor, power factor | – |
| Φ | heat flow rate, thermal power | kW |
| θ | Celsius temperature | °C |
| η | efficiency factor | – |
| c_p | specific heat capacity | kWh/m ³ K |
| c | specific mass, specific factor | kg/kW or - % |
| E | energy in general, including primary energy, except heat, work and auxiliary electric energy | kWh |
| f | conversion factor, correction factor | – |
| H | parameter height of building | m |
| k | factor, Part of recoverable auxiliary energy, Part of envelope losses | – |
| K | burner multistage or modulation ratio | – |
| n | exponent | – |
| P | power in general, including electrical (auxiliary) power | kW |
| Q | quantity of heat | kWh |
| t | time, period of time | h |
| T | thermodynamic temperature | K |
| W | electrical (auxiliary) energy | kWh |
| y | electrical (auxiliary) energy rate as percentage of nominal heat input | – |