



SLOVENSKI STANDARD
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Heating systems in buildings - Method for calculation of system energy requirements and system efficiencies - Part 1: General

Heizanlagen in Gebäuden - Verfahren zur Berechnung des Energiebedarfs und Nutzungsgrade der Anlagen - Teil 1: Allgemeines

Systemes de chauffage dans les bâtiments - Méthode de calcul des exigences énergétiques et des rendements du système - Partie 1: Généralités

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ICS:

91.140.10	Sistemi centralnega ogrevanja	Central heating systems
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ICS 91.140.10

English Version

Heating systems in buildings - Method for calculation of system energy requirements and system efficiencies - Part 1: General

Systèmes de chauffage dans les bâtiments - Méthode de calcul des besoins énergétiques et des rendements des systèmes - Partie 1: Généralités

Heizsysteme in Gebäuden - Verfahren zur Berechnung der Energieanforderungen und Wirkungsgrade von Systemen - Teil 1: Allgemeines

This European Standard was approved by CEN on 21 June 2007.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (EN 15316-1:2007) has been prepared by Technical Committee CEN/TC 228 "Heating systems in buildings", the secretariat of which is held by DS.

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of an identical text or by endorsement, at the latest by January 2008, and conflicting national standards shall be withdrawn at the latest by January 2008.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association (Mandate M/343), and supports essential requirements of EU Directive 2002/91/EC on the energy performance of buildings (EPBD). It forms part of a series of standards aimed at European harmonisation of the methodology for calculation of the energy performance of buildings. An overview of the whole set of standards is given in prCEN/TR 15615.

The subjects covered by CEN/TC 228 are the following:

- design of heating systems (water based, electrical etc.);
- installation of heating systems;
- commissioning of heating systems;
- instructions for operation, maintenance and use of heating systems;
- methods for calculation of the design heat loss and heat loads;
- methods for calculation of the energy performance of heating systems.

Heating systems also include the effect of attached systems such as hot water production systems.

All these standards are systems standards, i.e. they are based on requirements addressed to the system as a whole and not dealing with requirements to the products within the system.

Where possible, reference is made to other European or International Standards, a.o. product standards. However, use of products complying with relevant product standards is no guarantee of compliance with the system requirements.

The requirements are mainly expressed as functional requirements, i.e. requirements dealing with the function of the system and not specifying shape, material, dimensions or the like.

The guidelines describe ways to meet the requirements, but other ways to fulfil the functional requirements might be used if fulfilment can be proved.

Heating systems differ among the member countries due to climate, traditions and national regulations. In some cases requirements are given as classes so national or individual needs may be accommodated.

In cases where the standards contradict with national regulations, the latter should be followed.

EN 15316 *Heating systems in buildings — Method for calculation of system energy requirements and system efficiencies* consists of the following parts:

Part 1: General

Part 2-1: Space heating emission systems

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Part 2-3: Space heating distribution systems

Part 3-1: Domestic hot water systems, characterisation of needs (tapping requirements)

Part 3-2: Domestic hot water systems, distribution

Part 3-3: Domestic hot water systems, generation

Part 4-1: Space heating generation systems, combustion systems (boilers)

Part 4-2: Space heating generation systems, heat pump systems

Part 4-3: Heat generation systems, thermal solar systems

Part 4-4: Heat generation systems, building-integrated cogeneration systems

Part 4-5: Space heating generation systems, the performance and quality of district heating and large volume systems

Part 4-6: Heat generation systems, photovoltaic systems

Part 4-7: Space heating generation systems, biomass combustion systems

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, 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.

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Introduction

This European Standard constitutes the general part of a set of standards on calculation method for determining system energy requirements and system efficiencies of space heating systems and domestic hot water systems. Other parts of this set of standards cover specific calculation methods related to the various sub-systems of the heating system.

The calculation method is used for the following applications:

- judging compliance with regulations expressed in terms of energy targets;
- optimisation of the energy performance of a planned building, by applying the method to several possible options;
- displaying a conventional level of energy performance of existing buildings;
- assessing the effect of possible energy conservation measures on an existing building, by calculation of the energy requirements with and without the energy conservation measure implemented;
- predicting future energy resource needs on a national or international scale, by calculation of the energy requirements of several buildings which are representative of the entire building stock.

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1 Scope

This European Standard specifies the structure for calculation of energy use for space heating systems and domestic hot water systems in buildings. It standardises the required inputs and outputs for the calculations, in order to achieve a common European calculation method.

The calculation method facilitates the energy analysis of the different sub-systems of the heating system, including control (emission, distribution, storage, generation), through determination of the system energy losses and the system performance factors. This performance analysis permits the comparison between sub-systems and makes it possible to monitor the impact of each sub-system on the energy performance of the building.

Calculations of the system energy losses of each sub-system of the heating system are defined in subsequent standards (prEN 15316, parts 2-x, 3-x and 4-x). The system thermal losses, the recoverable system thermal losses and the auxiliary energy of the sub-systems of the heating system are summed up. The system thermal losses of the heating system contribute to the overall energy use in buildings (prEN 15603).

Ventilation systems are not included in this European Standard (e.g. balanced systems with heat recovery), but if the air is preheated or an air heating system is installed, system energy losses of these systems are covered by this European Standard.

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.

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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 15316-1:2007

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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*

prEN 15316-3-2, *Heating systems in buildings — Method for calculation of system energy requirements and system efficiencies — Part 3-2: Domestic hot water systems, distribution*

prEN 15603¹⁾, *Energy performance of buildings — Overall energy use and definition of energy ratings*

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

EN ISO 13790, *Thermal performance of buildings — Calculation of building energy use for space heating (ISO 13790:2004)*

3 Terms and 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.

NOTE This European Standard is the reference for definitions for the whole set of prEN 15316 standards. Therefore not all definitions mentioned hereafter are used in this part.

¹⁾ To be published.

3.1.1**auxiliary energy**

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

NOTE 1 This includes energy for fans, pumps, electronics etc. Electrical energy input to the ventilation system for air transport and heat recovery is not considered as auxiliary energy, but as energy use for ventilation.

NOTE 2 In EN ISO 9488, the energy used for pumps and valves is called "parasitic energy".

3.1.2**building**

construction as a whole, including its envelope and all technical building systems, for which energy is used to condition the indoor climate, to provide domestic hot water and illumination and other services related to the use of the building

NOTE The term can refer to the building as a whole or to parts thereof that have been designed or altered to be used separately.

3.1.3**new building**

for calculated energy rating: building at design stage or under construction

for measured energy rating: building too recently constructed to have reliable records of energy use

3.1.4**existing building**

for calculated energy rating: building that is erected

for measured energy rating: building for which actual data necessary to assess the energy use are known or can be measured

3.1.5**building services**

services provided by technical building systems and by appliances to provide indoor climate conditions, domestic hot water, illumination levels and other services related to the use of the building

3.1.6**calculated energy rating**

energy rating based on calculations of the weighted delivered and exported energy of a building for heating, cooling, ventilation, domestic hot water and lighting

NOTE National bodies decide whether other energy uses resulting from occupants' activities such as cooking, production, laundering etc. are included or not. If included, standard input data need to be provided for the various types of building and uses. Lighting is always included except (by decision of national bodies) for residential buildings.

3.1.7**calculation step**

discrete time interval for the calculation of the energy needs and uses for heating, cooling, humidification and dehumidification

NOTE Typical discrete time intervals are one hour, one month or one heating and/or cooling season, operating modes and bins.

3.1.8**calculation period**

period of time over which the calculation is performed

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

3.1.9

conditioned area

floor area of conditioned spaces excluding non-habitable cellars or non-habitable parts of a space, including the floor area on all storeys if more than one

NOTE 1 The precise definition of the conditioned area is given by national authorities.

NOTE 2 Internal, overall internal or external dimensions can be used. This leads to different areas for the same building.

NOTE 3 Some services, such as lighting or ventilation, might be provided to areas not included in this definition (e.g. a car park).

NOTE 4 Conditioned area can be taken as the useful area mentioned in the Articles 5, 6 and 7 of the EPBD²⁾ unless it is otherwise defined in national regulations.

3.1.10

conditioned space

heated and/or cooled space

NOTE The heated and/or cooled spaces are used to define the thermal envelope.

3.1.11

conditioned zone

part of a conditioned space with a given set-point temperature or set-point temperatures, throughout which there is the same occupancy pattern and the internal temperature is assumed to have negligible spatial variations, and which is controlled by a single heating system, cooling system and/or ventilation system

3.1.12

CO₂ emission coefficient

quantity of CO₂ emitted to the atmosphere per unit of delivered energy

NOTE The CO₂ emission coefficient can also include the equivalent emissions of other greenhouse gases (e.g. methane).

3.1.13

cogeneration

simultaneous generation in one process of thermal energy and electrical or mechanical energy

NOTE Also known as combined heat and power (CHP).

3.1.14

delivered energy

energy content, expressed per energy carrier, supplied to the technical building systems through the system boundary, to satisfy the uses taken into account (e.g. heating, cooling, ventilation, domestic hot water, lighting, appliances) or to produce electricity

NOTE 1 For active solar and wind energy systems, the incident solar radiation on solar panels or on solar collectors or the kinetic energy of wind is not part of the energy balance of the building. It is decided on a national level whether or not renewable energy produced on site constitutes part of the delivered energy.

NOTE 2 Delivered energy can be calculated for defined energy uses or it can be measured.

3.1.15

domestic hot water heating

process of heat supply to raise the temperature of the cold water to the intended delivery temperature

²⁾ Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings

3.1.16**efficiency, distribution**

ratio between the energy output of the distribution sub-system and the energy input of the distribution sub-system, taking into account the sub-system thermal losses and the auxiliary energy

3.1.17**efficiency, emission**

ratio between the energy output of the emission sub-system (energy need) and the energy input of the emission sub-system, taking into account the sub-system thermal losses (e.g. non-ideal emission system causing non-uniform temperature distribution and non-ideal room temperature control). The efficiency includes the auxiliary energy

3.1.18**efficiency, generation**

ratio between the energy output of the generation sub-system and the energy input of the generation sub-system (energy use), taking into account the sub-system thermal losses. The efficiency includes the auxiliary energy

3.1.19**energy indicator**

energy rating divided by the conditioned area

3.1.20**energy conversion factor or energy conversion coefficient**

factor or coefficient used to express the energy content in different ways (e.g. primary energy, CO₂ emissions)

NOTE 1 Coefficients have dimensions, factors are dimensionless.

NOTE 2 See also: total primary energy factor, CO₂ emission coefficient.

3.1.21**energy need for heating or cooling**

heat to be delivered to or extracted from a conditioned space to maintain the intended temperature during a given period of time, not taking into account the technical building thermal systems

NOTE 1 The energy need is calculated and cannot easily be measured.

NOTE 2 The energy need can include additional heat transfer resulting from non-uniform temperature distribution and non-ideal temperature control, if they are taken into account by increasing (decreasing) the effective temperature for heating (cooling) and not included in the heat transfer due to the heating (cooling) system.

3.1.22**energy need for domestic hot water**

heat to be delivered to the needed amount of domestic hot water, to raise its temperature from the cold network temperature to the prefixed delivery temperature at the delivery point, not taking into account the technical building thermal systems

3.1.23**energy use for space heating or cooling or domestic hot water**

energy input to the heating, cooling or domestic hot water system to satisfy the energy need for heating, cooling (including dehumidification) or domestic hot water, respectively

NOTE If the technical building system serves several purposes (e.g. heating and domestic hot water) it can be difficult to split the energy use into that used for each purpose. It can be indicated as a combined quantity (e.g. energy need for space heating and domestic hot water).

3.1.24**energy use for ventilation**

electrical energy input to the ventilation system for air transport and heat recovery (not including the energy input for preheating the air) and energy input to the humidification systems to satisfy the need for humidification