



SLOVENSKI STANDARD
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Heating systems in buildings - Method for calculation of system energy requirements and system efficiencies - Part 3-3: Domestic hot water systems, generation

Heizsysteme in Gebäuden - Verfahren zur Berechnung der Energieanforderungen und Nutzungsgrade der Anlagen - Teil 3-3: Trinkwassererwärmung, Erzeugung

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Systemes de chauffage dans les bâtiments - Méthode de calcul des exigences énergétiques et des rendements du système - Partie 3.3 : Systemes d'eau chaude domestique, production

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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 3-3:
Domestic hot water systems, generation

Systèmes de chauffage dans les bâtiments - Méthode de
calcul des besoins énergétiques et des rendements des
systèmes - Partie 3-3 : Systèmes de production d'eau
chaude sanitaire, génération

Heizungsanlagen in Gebäuden - Verfahren zur Berechnung
der Energieanforderungen und Nutzungsgrade der Anlagen
- Teil 3-3: Trinkwassererwärmung, Erzeugung

This European Standard was approved by CEN on 18 August 2007.

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Foreword

This document (EN 15316-3-3:2007) 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of an identical text or by endorsement, at the latest by April 2008, and conflicting national standards shall be withdrawn at the latest by April 2008.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 15615.¹

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.

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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

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

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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.

Introduction

This European Standard is one of a number of standards that together describe methods for calculation of system energy requirements and system efficiencies related to domestic hot water systems. In particular this European Standard specifies methods for calculation of the input energy requirements and energy losses of the generation units.

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

Only the calculation methods are normative. Values necessary to complete the calculations should be given in a national annex.

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1 Scope

This European Standard is part of a set of standards covering the methods for calculation of system energy requirements and system efficiencies of heating systems in buildings. In particular this standard is one of a number of standards dealing with domestic hot water systems.

The scope of this specific part is to standardise the methods for calculation of:

- thermal losses from the domestic hot water generation system;
- recoverable thermal losses for space heating from the domestic hot water generation system;
- auxiliary energy of the domestic hot water generation systems.

These values are input data for calculation of the overall energy use according to prEN 15603 and EN 15316-1.

This European Standard specifies the:

- inputs;
- calculation methods;
- outputs.

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2 Normative references (standards.iteh.ai)

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 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 50440, *Efficiency of domestic electrical storage water-heaters*

3 Terms and definitions

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

3.1

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 a 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".

3.2

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.

**3.3
calculation period**

period of time over which the calculation is performed

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

**3.4
domestic hot water heating**

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

**3.5
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

**3.6
energy use for space heating or cooling or domestic hot water**

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

NOTE If the technical building system serves several purposes (e.g. space 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).

**3.7
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 According to ISO 13602-2, the gross calorific value is preferred to the net calorific value.

NOTE 3 The net calorific value does not take into account the latent heat of condensation.

**3.8
heating or cooling season**

period of the year during which a significant amount of energy for heating or cooling is needed

NOTE The season lengths are used to determine the operation period of technical systems.

**3.9
heat recovery**

heat generated by a technical building system or linked to a building use (e.g. domestic hot water) which is utilised directly in the related system to lower the heat input and which would otherwise be wasted (e.g. preheating of the combustion air by flue gas heat exchanger)

**3.10
part load operation**

operation state of the technical system (e.g. heat pump), where the actual load requirement is below the actual output capacity of the device

3.11**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 This depends on the calculation approach chosen to calculate the recovered gains and losses (holistic or simplified approach).

3.12**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

3.13**system boundary**

boundary that includes within it all areas associated with the building (both inside and outside the building) where energy is consumed or produced

NOTE Inside the system boundary, the system losses are taken into account explicitly, outside the system boundary they are taken into account by the conversion factor.

3.14**system thermal loss**

thermal loss from a technical building system for heating, cooling, domestic hot water, humidification, dehumidification, or ventilation or lighting that does not contribute to the useful output of the system

NOTE 1 A system loss can become an internal heat gain for the building, if it is recoverable.

NOTE 2 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.

NOTE 3 Heat dissipated by the lighting system or by other services (e.g. appliances of computer equipment) is not part of the system thermal losses, but part of the internal heat gains.

3.15**tapping program**

24-hour cycle that defines a number of domestic hot water draw-off requirements: succession of energy needs corresponding to uses of domestic hot water during a day

NOTE The tapping program is also called tapping cycle and tapping patterns.

3.16**technical building system**

technical equipment for heating, cooling, ventilation, domestic hot water, lighting and electricity production composed by sub-systems

NOTE 1 A technical building system can refer to one or to several building services (e.g. heating system, space heating and domestic hot water system).

NOTE 2 Electricity production can include cogeneration and photovoltaic systems.

3.17**technical building sub-system**

part of a technical building system that performs a specific function (e.g. heat generation, heat distribution, heat emission)

4 Symbols, units and indices

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

Table 1 — Symbols and units

Symbol	Name of quantity	Unit
A	area	m ²
D	diameter	m
L	length	m
t	time, period of time	s
Q	quantity of heat, energy	J
P	electrical power	W
V	volume	m ³
W	auxiliary (electrical) energy	J
x, y, z	constants	-
φ	load factor	
α	part	-
η	efficiency	-
θ	celsius temperature	°C
X	coefficient of relative quantity of energy delivered versus maximum energy stored	-

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