1500 CUMPA

Hoonete küttesüsteemid. Süsteemide energiavajaduse ja süsteemide tõhususe arvutusmeetod. Osa 2-3: Kütte jaotussüsteemid

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



EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

2-3:2007 sisaldab Euroopa standardi EN 15316-2-3:2007 ingliskeelset teksti.	3:2007 consists of the English text of the European standard EN 15316-2-3:2007.
Käesolev dokument on jõustatud 14.09.2007 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.	This document is endorsed on 14.09.2007 with the notification being published in the official publication of the Estonian national standardisation organisation.
Standard on kättesaadav Eesti standardiorganisatsioonist.	The standard is available from Estonian standardisation organisation.

Käsitlusala: Scope: This European Standard provides a This European Standard provides a methodology to calculate/estimate the methodology to calculate/estimate the system thermal loss of water based system thermal loss of water based distribution systems for heating and the distribution systems for heating and the auxiliary energy demand, as well as the auxiliary energy demand, as well as the recoverable part of each. The actual recoverable part of each. The actual recovered energy depends on the gain to recovered energy depends on the gain to loss ratio. Different levels of accuracy, loss ratio. Different levels of accuracy, corresponding to the needs of the user corresponding to the needs of the user and the input data available at each and the input data available at each design stage of the project, are provided design stage of the project, are provided in this European Standard by different in this European Standard by different calculation methods, i.e. a detailed calculation methods, i.e. a detailed calculation method, a simplified calculation method, a simplified calculation method and a method based calculation method and a method based on tabulated values. The general method on tabulated values. The general method of calculation can be applied for any timeof calculation can be applied for any timestep (hour, day, month or year). Pipework step (hour, day, month or year). Pipework lengths for the heating of decentralised, lengths for the heating of decentralised, non-domestic ventilation systems non-domestic ventilation systems equipment are to be calculated in the equipment are to be calculated in the same way as for water based heating same way as for water based heating systems. For centralised, non-domestic systems. For centralised, non-domestic ventilation systems equipment, the length ventilation systems equipment, the length is to be specified in accordance with its is to be specified in accordance with its location. location.

ICS 91.140.10

Võtmesõnad:

Eesti Standardikeskusele kuulub standardite reprodutseerimis- ja levitamisõigus

EUROPEAN STANDARD NORME EUROPÉENNE **EUROPÄISCHE NORM**

EN 15316-2-3

July 2007

ICS 91.140.10

English Version

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

Systèmes de chauffage dans les bâtiments - Méthode de calcul des besoins énergétiques et des rendements des systèmes - Partie 2-3: Systèmes de distribution de chauffage des locaux

Heizsysteme in Gebäuden - Verfahren zur Berechnung der Energieanforderungen und Nutzungsgrade der Anlagen -Teil 2-3: Wärmeverteilungssysteme

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

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

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Ref. No. EN 15316-2-3:2007: E

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Foreword

This document (EN 15316-2-3:2007) 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 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

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.

iny, Greec, Poland, Portugal, rc.

Introduction

In a distribution system, energy is transported by a fluid from the heat generation to the heat emission. As the distribution system is not adiabatic, part of the energy carried is emitted to the surrounding environment. Energy is also required to distribute the heat carrier fluid within the distribution system. In most cases this is electrical energy required by the circulation pumps. This leads to additional thermal and electrical energy demand.

The thermal energy emitted by the distribution system and the electrical energy required for the distribution, may partially be recovered as heat, if the distribution system is placed inside the heated envelope of the building.

This European Standard provides three methods of calculation.

The detailed calculation method describes the basics and the physical background of the general calculation method. The required input data are part of the detailed project data assumed to be available (such as length of pipes, type of insulation, manufacturer's data for the pumps etc.). The detailed calculation method provides the most accurate energy demand and heat emission.

For the simplified calculation method, some assumptions are made for the most relevant cases, reducing the required input data (e.g. the lengths of pipes are calculated by approximations depending on the outer dimensions of the building and efficiency of pumps is approximated). This method may be applied if only few data are available (in general at an early stage of design). With the simplified calculation method, the calculated energy demand is generally higher than the calculated energy demand by the detailed calculation method. The assumptions made for the simplified method depend on national design, and therefore this method is part of informative Annex A.

The tabulated calculation method is based on the simplified calculation method, with some further assumptions being made. Only input data for the most important influences are required with this method. The further assumptions made for this method depend on national design as well, and therefore the tabulated method is also part of informative Annex A.

Other influences, which are not reflected by the tabulated values, shall be calculated by the simplified or the detailed calculation method. The energy demand determined from the tabulated calculation method is generally higher than the calculated energy demand by the simplified calculation method. Use of this method is possible with a minimum of input data.

The general calculation method for the electrical energy demand of pumps consists of two parts. The first part is calculation of the hydraulic demand of the distribution system, and the second part is calculation of the expenditure energy factor of the pump. Here, it is possible to combine the detailed and the simplified calculation method. For example, calculation of pressure loss and flow may be done by the detailed calculation method and calculation of the expenditure energy factor may be done by the simplified calculation method (when the data of the building are available and the data of the pump are not available) or vice versa.

In national annexes, the simplified calculation method as well as the tabulated calculation method could be applied through a.o. relevant boundary conditions of each country, thus facilitating easy calculations and quick results. In national annexes, it is only allowed to change the boundary conditions and other assumptions. The calculation methods as described are to be applied.

The recoverable part of the auxiliary energy demand is given as a fixed ratio and is therefore also easy to determine.

1 Scope

This European Standard provides a methodology to calculate/estimate the system thermal loss of water based distribution systems for heating and the auxiliary energy demand, as well as the recoverable part of each. The actual recovered energy depends on the gain to loss ratio. Different levels of accuracy, corresponding to the needs of the user and the input data available at each design stage of the project, are provided in this European Standard by different calculation methods, i.e. a detailed calculation method, a simplified calculation method and a method based on tabulated values. The general method of calculation can be applied for any time-step (hour, day, month or year).

Pipework lengths for the heating of decentralised, non-domestic ventilation systems equipment are to be calculated in the same way as for water based heating systems. For centralised, non-domestic ventilation systems equipment, the length is to be specified in accordance with its location.

NOTE It is possible to calculate the system thermal loss and auxiliary energy demand for cooling systems with the same calculation methods as shown in this European Standard. Specifically, determination of auxiliary energy demand is based on the same assumptions for efficiency of pumps, because the efficiency curve applied is an approximation for inline and external motors. It needs to be decided by the standardisation group of CEN, whether or not the extension for cooling systems should be made in this European Standard. This is also valid for distribution systems in HVAC (in ducts) and also for special liquids.

2 Normative references

The following referenced documents are incispensable 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 12831, Heating systems in buildings — Method for calculation of the design heat load

3 Terms and definitions

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

3.1

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, heating and domestic hot water system).

NOTE 2 Electricity production can include cogeneration and photovoltaic systems.

3.2

technical building sub-system

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

3.3

space heating

process of heat supply for thermal comfort

3.4

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