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Thermal insulation for building equipment and industrial installations - Calculation rules

EESTI STANDARDIKESKUS EVS
EESTONIAN CENTRE FOR STANDARDISATION

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN ISO 12241:2008 sisaldab Euroopa standardi EN ISO 12241:2008 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 12241:2008 consists of the English text of the European standard EN ISO 12241:2008.
Standard on kinnitatud Eesti Standardikeskuse 21.07.2008 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.	This standard is ratified with the order of Estonian Centre for Standardisation dated 21.07.2008 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.
Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 15.06.2008.	Date of Availability of the European standard text 15.06.2008.
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Võtmesõnad: arvutuseeskirjad, hooned, seadmed, soojaisolatsioon, soojakaod, soojaülekanne, torud, torustikud, vedelikutorustikud

EUROPEAN STANDARD

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English Version

Thermal insulation for building equipment and industrial installations - Calculation rules (ISO 12241:2008)

Isolation thermique des équipements de bâtiments et des installations industrielles - Méthodes de calcul (ISO 12241:2008)
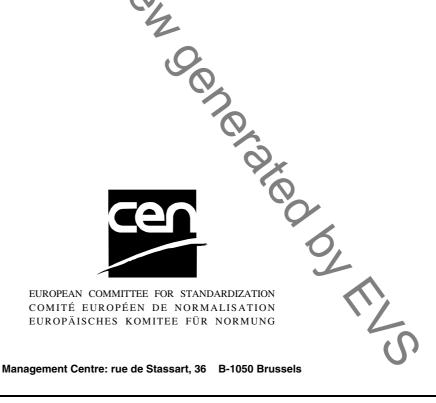
Wärmedämmung an haus- und betriebstechnischen Anlagen - Berechnungsregeln (ISO 12241:2008)

This European Standard was approved by CEN on 1 May 2008.

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN ISO 12241:2008) has been prepared by Technical Committee ISO/TC 163 "Thermal performance and energy use in the built environment" in collaboration with Technical Committee CEN/TC 89 "Thermal performance of buildings and building components" the secretariat of which is held by SIS.

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 December 2008, and conflicting national standards shall be withdrawn at the latest by December 2008.

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.

This document supersedes EN ISO 12241:1998.

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 the United Kingdom.

Endorsement notice

The text of ISO 12241:2008 has been approved by CEN as a EN ISO 12241:2008 without any modification.

Contents

Introduction

Methods relating to conduction are direct mathematical derivations from Fourier's law of heat conduction, so international consensus is purely a matter of mathematical verification. No significant difference in the equations used in the member countries exists. For convection and radiation, however, there are no methods in practical use that are mathematically traceable to Newton's law of cooling or the Stefan-Boltzman law of thermal radiation without some empirical element. For convection in particular, many different equations have been developed, based on laboratory data. Different equations have become popular in different countries, and no exact means are available to select between these equations.

Within the limitations given, these methods can be applied to most types of industrial, thermal-insulation, heat-transfer problems.

These methods do not take into account the permeation of air or the transmittance of thermal radiation through transparent media.

The equations in these methods require for their solution that some system variables be known, given, assumed or measured. In all cases, the accuracy of the results depends on the accuracy of the input variables. This International Standard contains no guidelines for accurate measurement of any of the variables. However, it does contain guides that have proven satisfactory for estimating some of the variables for many industrial thermal systems.

It should be noted that the steady-state calculations are dependent on boundary conditions. Often a solution at one set of boundary conditions is not sufficient to characterize a thermal system that operates in a changing thermal environment (process equipment operating year-round, outdoors, for example). In such cases, it is necessary to use local weather data based on yearly averages or yearly extremes of the weather variables (depending on the nature of the particular calculation) for the calculations in this International Standard.

In particular, the user should not infer from the methods of this International Standard that either insulation quality or avoidance of dew formation can be reliably assured based on minimal, simple measurements and application of the basic calculation methods given here. For most industrial heat flow surfaces, there is no isothermal state (no one, homogeneous temperature across the surface), but rather a varying temperature profile. This condition suggests the requirement for numerous calculations to properly model thermal characteristics of any one surface. Furthermore, the heat flow through a surface at any point is a function of several variables that are not directly related to insulation quality. Among others, these variables include ambient temperature, movement of the air, roughness and emissivity of the heat flow surface, and the radiation exchange with the surroundings (which often vary widely). For calculation of dew formation, variability of the local humidity is an important factor.

Except inside buildings, the average temperature of the radiant background seldom corresponds to the air temperature, and measurement of background temperatures, emissivities and exposure areas is beyond the scope of this International Standard. For these reasons, neither the surface temperature nor the temperature difference between the surface and the air can be used as a reliable indicator of insulation performance or avoidance of dew formation.

Clauses 4 and 5 of this International Standard give the methods used for industrial thermal insulation calculations not covered by more specific standards. In applications where it is not necessary to assure precise values of heat energy conservation or (insulated) surface temperature, or where critical temperatures for dew formation are either not approached or not a factor, these methods can be used to calculate heat flow rates.

Clauses 6 and 7 of this International Standard are adaptations of the general equation for specific applications of calculating heat flow temperature drop and freezing times in pipes and other vessels.

Annexes B and C of this International Standard are for information only.

Thermal insulation for building equipment and industrial installations — Calculation rules

1 Scope

This International Standard gives rules for the calculation of heat-transfer-related properties of building equipment and industrial installations, predominantly under steady-state conditions. This International Standard also gives a simplified approach for the treatment of thermal bridges.

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.

ISO 7345, *Thermal insulation — Physical quantities and definitions*

ISO 9346, *Hygrothermal performance of buildings and building materials — Physical quantities for mass transfer — Vocabulary*

ISO 10211, *Thermal bridges in building construction — Heat flows and surface temperatures — Detailed calculations*

ISO 13787, *Thermal insulation products for building equipment and industrial installations — Determination of declared thermal conductivity*

ISO 23993, *Thermal insulation for building equipment and industrial installations — Determination of design thermal conductivity*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7345, ISO 9346, ISO 13787 and ISO 23993 apply.