SLOVENSKI STANDARD
SIST EN ISO 9288:1997

01-december-1997

Toplotna izolacija - Prenos toplote s sevanjem - Fizikalne količine in definicije (ISO 9288:1989)

Thermal insulation - Heat transfer by radiation - Physical quantities and definitions (ISO 9288:1989)

Wärmeschutz - Wärmeübertragung durch Strahlung - Physikalische Größen und Definitionen (ISO 9288:1989)

Isolation thermique - Transfert de chaleur par rayonnement - Grandeurs physiques et définitions (ISO 9288:1989)

Ta slovenski standard je istoveten z: EN ISO 9288:1996

ICS:

01.040.91	Gradbeni materiali in gradnja (Slovarji)	Construction materials and building (Vocabularies)
01.060	Veličine in enote	Quantities and units
91.120.10	Toplotna izolacija stavb	Thermal insulation

SIST EN ISO 9288:1997 **en**

EUROPEAN STANDARD

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Descriptors: see ISO document

English version

Thermal insulation - Heat transfer by radiation - Physical quantities and definitions (ISO 9288:1989)

Isolation thermique - Transfert de chaleur par rayonnement - Grandeurs physiques et définitions (ISO 9288:1989)

Wärmeschutz - Wärmeübertragung durch Strahlung - Physikalische Größen und Definitionen (ISO 9288:1989)

This European Standard was approved by CEN on 1995-01-05. 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.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart,36 B-1050 Brussels

Ref. No. EN ISO 9288:1996 E

Foreword

The text of the International Standard from Technical Committee ISO/TC 163 "Thermal insulation" of the International Organization for Standardization (ISO) has been taken over as a European Standard by 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of an identical text or by endorsement, at the latest by November 1996, and conflicting national standards shall be withdrawn at the latest by November 1996.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of the International Standard ISO 9288:1989 has been approved by CEN as a European Standard without any modification.

INTERNATIONAL STANDARD

ISO 9288

First edition
1989-12-01

Thermal insulation — Heat transfer by radiation — Physical quantities and definitions

Isolation thermique — Transfert de chaleur par rayonnement — Grandeurs physiques et définitions

Reference number
ISO 9288 : 1989 (E)

Contents

Annex

International Organization for Standardization
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 9288 was prepared by Technical Committee ISO/TC 163, *Thermal insulation.*

Annex A of this International Standard is for information only.

Introduction

This International Standard forms part of a series of vocabularies related to thermal insulation.

The series will include

ISO 7345 : 1987, *Thermal insulation — Physical quantities and definitions.*

ISO 9229 : —[1], *Thermal insulation — Thermal insulating materials and products — Vocabulary.*

ISO 9251 : 1987, *Thermal insulation — Heat transfer conditions and properties of materials — Vocabulary.*

ISO 9346 : 1987, *Thermal insulation — Mass transfer — Physical quantities and definitions.*

1) To be published.

Thermal insulation — Heat transfer by radiation — Physical quantities and definitions

1 Scope

This International Standard defines physical quantities and other terms in the field of thermal insulation relating to heat transfer by radiation.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 7345 : 1987, *Thermal insulation — Physical quantities and definitions.*

3 General terms

3.1 thermal radiation: Electromagnetic radiation emitted at the surface of an opaque body or inside an element of a semi-transparent volume.

The thermal radiation is governed by the temperature of the emitting body and its radiative characteristics. It is interesting from a thermal viewpoint when the wavelength range falls between 0,1 µm and 100 µm (see figure 1).

3.2 heat transfer by radiation: Energy exchanges between bodies (apart from one another) by means of electromagnetic waves.

These exchanges can occur when the bodies are separated from one another by vacuum or by a transparent or a semi-transparent medium. To evaluate these radiation heat exchanges it is necessary to know how opaque and semi-transparent bodies emit, absorb and transmit radiation as a function of their nature, relative position and temperature.

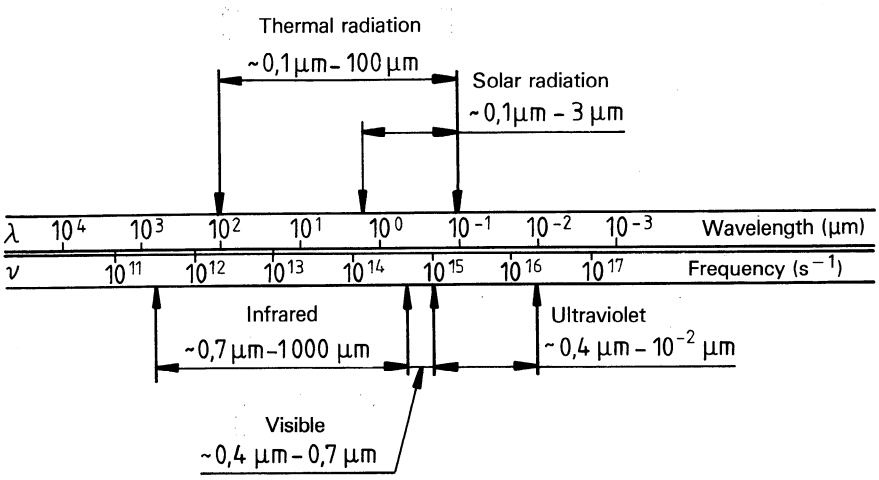

Figure 1 — Electromagnetic wave spectrum

3.3 Classification of the physical terms associated with thermal radiation

Physical terms associated with thermal radiation are classified according to two criteria:

- spectral distribution
- spatial distribution (directional)

of the radiation.

These physical terms are:

total, if they are related to the entire spectrum of thermal radiation (this designation can be considered as implicit);

spectral or monochromatic, if they are related to a spectral interval centred on the wavelength λ;

hemispherical, if they are related to all directions along which a surface element can emit or receive radiation;

directional, if they are related to the directions of propagation defined by a solid angle around the defined direction.

3.4 Classification of materials in relation with radiative transfer

opaque medium: Medium which does not transmit any fraction of the incident radiation.

The absorption, emission, reflection of radiation can be handled as surface phenomena.

semi-transparent medium: Medium in which the incident radiation is progressively attenuated inside the material by absorption or scattering, or both.

The absorption, scattering and emission of radiation are bulk (volume) phenomena.

The radiative properties of an opaque or semi-transparent medium are generally a function of the spectral and directional distribution of incident radiation and of the temperature of the medium.

NOTE — Thermal insulating materials are generally semi-transparent media.

4 Terms related to surfaces either receiving, transferring or emitting a thermal radiation

	Symbol for quantity	Symbol for SI unit (including multiple or sub-multiple)
4.1 radiant heat flow rate; radiant flux: Heat flow rate emitted, transferred or received by a system in form of electromagnetic waves. NOTE — This is a total hemispherical quantity.	Φ	W
4.2 total intensity: Radiant heat flow rate divided by the solid angle around the direction $\vec{\Delta}$: $I_\Omega = \frac{\partial \Phi}{\partial \Omega}$	I_Ω	W/sr
4.3 total radiance: Radiant heat flow rate divided by the solid angle around the direction $\vec{\Delta}$ and the projected area normal to this direction: $L_\Omega = \frac{\partial^2 \Phi}{\partial \Omega \, \partial (A \cos\theta)}$	L_Ω	W/(m²·sr)
4.4 spectral radiant heat flow rate: Radiant heat flow rate divided by the spectral interval centred on the wavelength λ: $\Phi_\lambda = \frac{\partial \Phi}{\partial \lambda}$	Φ_λ	W/m W/µm
4.5 spectral intensity: Total intensity divided by the spectral interval centred on the wavelength λ: $I_{\Omega\lambda} = \frac{\partial I_\Omega}{\partial \lambda}$	$I_{\Omega\lambda}$	W/(sr·m) W/(sr·µm)

	Symbol for quantity	Symbol for Si unit (including multiple or sub-multiple)
4.6 spectral radiance: Total radiance divided by the spectral interval centred on the wavelength λ:	$L_{\Omega\lambda}$	W/(m³·sr) W/(m²·sr·µm)

$$L_{\Omega\lambda} = \frac{\partial L_{\Omega}}{\partial \lambda}$$

NOTES

1 Each spectral term A_{λ} is related to the corresponding total term A by a relation of the type

$$A_{\lambda} = \frac{\partial A}{\partial \lambda} \text{ or } A = \int_{0}^{\infty} A_{\lambda} \, d\lambda$$

Each directional term A_{Ω} is related to the corresponding hemispherical term A by a relation of the type

$$A_{\Omega} = \frac{\partial A}{\partial \Omega} \text{ or } A = \int_{\Omega = 4\pi} A_{\Omega} \, d\Omega$$

and

$$A_{\Omega\lambda} = \frac{\partial^2 A}{\partial \Omega \, \partial \lambda} \text{ or } A = \int_{\Omega = 4\pi} \int_{0}^{\infty} A_{\Omega\lambda} \, d\lambda \, d\Omega$$

2 Total radiance and spectral radiance are oriented quantities (vectors) defined in each point of space where radiation exists (see figure 3), moreover their values are independent of the particular surface used to define them. Sources which radiate with constant L_{Ω} (see 4.3) are called **isotropic** or **diffuse**.

Intensities are again oriented quantities but belong to a surface (see figure 2).

Radiant flows (total or spectral) are not oriented quantities and belong to a surface.

	Symbol for quantity	Symbol for Si unit
4.7 spectral radiant density of heat flow rate vector:	$\vec{q}_{r,\lambda}$	W/(m²·µm)

$$\vec{q}_{r,\lambda} = \int_{\Omega = 4\pi} L_{\Omega\lambda} \vec{\Delta} \, d\Omega$$

	Symbol for quantity	Symbol for Si unit
4.8 total radiant density of heat flow rate vector:	$\vec{q}_{r}$	W/m³ W/m²

$$\vec{q}_{r} = \int_{0}^{\infty} \int_{\Omega = 4\pi} L_{\Omega\lambda} \vec{\Delta} \, d\Omega \, d\lambda$$

	Symbol for quantity	Symbol for Si unit
4.9 spectral radiant density of heat flow rate (in the direction $\vec{n}$):	$q_{r,\lambda n}$	W/m³ W/(m²·µm)

$$q_{r,\lambda n} = \vec{n} \cdot \vec{q}_{r,\lambda} = \int_{\Omega = 4\pi} L_{\Omega\lambda} \vec{\Delta} \cdot \vec{n} \, d\Omega$$