SLOVENSKI STANDARD
SIST EN ISO 11855-2:2015

01-oktober-2015

Okoljsko primerna zasnova stavb - Zasnova, dimenzioniranje, vgradnja in kontrola vgrajenih sevalnih ogrevalnih in hladilnih sistemov - 2. del: Določanje načrtovane grelne in hladilne moči (ISO 11855-2:2012)

Building environment design - Design, dimensioning, installation and control of embedded radiant heating and cooling systems - Part 2: Determination of the design heating and cooling capacity (ISO 11855-2:2012)

Umweltgerechte Gebäudeplanung - Planung, Auslegung, Installation und Steuerung flächenintegrierter Strahlheizungs- und -kühlsysteme - Teil 2: Bestimmung der Auslegungs-Heiz- bzw. Kühlleistung (ISO 11855-2:2012)012)

Conception de l'environnement des bâtiments - Conception, dimensionnement, installation et contrôle des systèmes intégrés de chauffage et de refroidissement par rayonnement - Partie 2 : Détermination de la puissance calorifique et frigorifique à la conception (ISO 11855-2:2012)

Ta slovenski standard je istoveten z: EN ISO 11855-2:2015

ICS:

91.140.10	Sistemi centralnega ogrevanja	Central heating systems
91.140.30	Prezračevalni in klimatski sistemi	Ventilation and air-conditioning

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EUROPEAN STANDARD

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EN 11855-2

August 2015

ICS 91.140.10; 91.140.30

English Version

Building environment design - Design, dimensioning, installation and control of embedded radiant heating and cooling systems - Part 2: Determination of the design heating and cooling capacity (ISO 11855-2:2012)

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COMITÉ EUROPÉEN DE NORMALISATION
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CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

The text of ISO 11855-2:2012 has been prepared by Technical Committee ISO/TC 205 “Building environment design” of the International Organization for Standardization (ISO) and has been taken over as EN ISO 11855-2:2015 by Technical Committee CEN/TC 228 “Heating systems and water based cooling systems in buildings” the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by February 2016, and conflicting national standards shall be withdrawn at the latest by February 2016.

This standard is applicable for design, construction and operation of radiant heating and cooling systems. The methods defined in part 2 are intended to determine the design heating or cooling capacity used for the design and evaluation of the performance of the system.
For identifying product characteristics by testing and proving the thermal output of heating and cooling surfaces embedded in floors, ceilings and walls the standard series EN 1264 can be used.

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Endorsement notice

The text of ISO 11855-2:2012 has been approved by CEN as EN ISO 11855-2:2015 without any modification.

INTERNATIONAL STANDARD

ISO 11855-2

First edition
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Building environment design — Design, dimensioning, installation and control of embedded radiant heating and cooling systems —

Part 2: Determination of the design heating and cooling capacity

Conception de l'environnement des bâtiments — Conception, construction et fonctionnement des systèmes de chauffage et de refroidissement par rayonnement —
Partie 2: Détermination de la puissance calorifique et frigorifique à la conception

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 11855-2 was prepared by Technical Committee ISO/TC 205, *Building environment design*.

ISO 11855 consists of the following parts, under the general title *Building environment design — Design, dimensioning, installation and control of embedded radiant heating and cooling systems*:

— *Part 1: Definition, symbols, and comfort criteria*

— *Part 2: Determination of the design and heating and cooling capacity*

— *Part 3: Design and dimensioning*

— *Part 4: Dimensioning and calculation of the dynamic heating and cooling capacity of Thermo Active Building Systems (TABS)*

— *Part 5: Installation*

— *Part 6: Control*

Part 1 specifies the comfort criteria which should be considered in designing embedded radiant heating and cooling systems, since the main objective of the radiant heating and cooling system is to satisfy thermal comfort of the occupants. Part 2 provides steady-state calculation methods for determination of the heating and cooling capacity. Part 3 specifies design and dimensioning methods of radiant heating and cooling systems to ensure the heating and cooling capacity. Part 4 provides a dimensioning and calculation method to design Thermo Active Building Systems (TABS) for energy-saving purposes, since radiant heating and cooling systems can reduce energy consumption and heat source size by using renewable energy. Part 5 addresses the installation process for the system to operate as intended. Part 6 shows a proper control method of the radiant heating and cooling systems to ensure the maximum performance which was intended in the design stage when the system is actually being operated in a building.

Introduction

The radiant heating and cooling system consists of heat emitting/absorbing, heat supply, distribution, and control systems. The ISO 11855 series deals with the embedded surface heating and cooling system that directly controls heat exchange within the space. It does not include the system equipment itself, such as heat source, distribution system and controller.

The ISO 11855 series addresses an embedded system that is integrated with the building structure. Therefore, the panel system with open air gap, which is not integrated with the building structure, is not covered by this series.

The ISO 11855 series shall be applied to systems using not only water but also other fluids or electricity as a heating or cooling medium.

The object of the ISO 11855 series is to provide criteria to effectively design embedded systems. To do this, it presents comfort criteria for the space served by embedded systems, heat output calculation, dimensioning, dynamic analysis, installation, operation, and control method of embedded systems.

Building environment design — Design, dimensioning, installation and control of embedded radiant heating and cooling systems —

Part 2: Determination of the design heating and cooling capacity

1 Scope

This part of ISO 11855 specifies procedures and conditions to enable the heat flow in water based surface heating and cooling systems to be determined relative to the medium differential temperature for systems. The determination of thermal performance of water based surface heating and cooling systems and their conformity to this part of ISO 11855 is carried out by calculation in accordance with design documents and a model. This should enable a uniform assessment and calculation of water based surface heating and cooling systems.

The surface temperature and the temperature uniformity of the heated/cooled surface, nominal heat flow density between water and space, the associated nominal medium differential temperature, and the field of characteristic curves for the relationship between heat flow density and the determining variables are given as the result.

This part of ISO 11855 includes a general method based on Finite Difference or Finite Element Methods and simplified calculation methods depending on position of pipes and type of building structure.

The ISO 11855 series is applicable to water based embedded surface heating and cooling systems in residential, commercial and industrial buildings. The methods apply to systems integrated into the wall, floor or ceiling construction without any open air gaps. It does not apply to panel systems with open air gaps which are not integrated into the building structure.

The ISO 11855 series also applies, as appropriate, to the use of fluids other than water as a heating or cooling medium. The ISO 11855 series is not applicable for testing of systems. The methods do not apply to heated or chilled ceiling panels or beams.

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 11855-1:2012, *Building environment design — Design, dimensioning, installation and control of embedded radiant heating and cooling systems — Part 1: Definition, symbols, and comfort criteria*

EN 1264-2, *Water based surface embedded heating and cooling systems — Part 2: Floor heating: Prove methods for the determination of the thermal output using calculation and test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11855-1:2012 apply.

4 Symbols and abbreviations

For the purposes of this document, the symbols and abbreviations in Table 1 apply.

Table 1 — Symbols and abbreviations

Symbol	Unit	Quantity
α_i	—	Parameter factors for calculation of characteristic curves
A_A	m^2	Surface of the occupied area
A_F	m^2	Surface of the heating/cooling surface area
A_R	m^2	Surface of the peripheral area
b_u	—	Calculation factor depending on the pipe spacing
B, B_G, B_0	$W/(m^2 \cdot K)$	Coefficients depending on the system
D	m	External diameter of the pipe, including sheathing where used
d_a	m	External diameter of the pipe
d_i	m	Internal diameter of the pipe
d_M	m	External diameter of sheathing
c_W	kJ/(kg·K)	Specific heat capacity of water
h_t	$W/(m^2 \cdot K)$	Total heat exchange coefficient (convection + radiation) between surface and space
K_H	$W/(m^2 \cdot K)$	Equivalent heat transmission coefficient
K_{WL}	—	Parameter for heat conducting devices
k_{fin}	—	Parameter for heat conducting devices
k_{CL}	—	Parameter for heat conducting layer
L_{WL}	m	Width of heat conducting devices
L_{fin}	m	Width of fin (horizontal part of heat conducting device seen as a heating fin)
L_R	m	Length of installed pipes
m	—	Exponents for determination of characteristic curves
m_H	kg/s	Design heating/cooling medium flow rate
n, n_G	—	Exponents
q	W/m^2	Heat flux at the surface
q_A	W/m^2	Heat flux in the occupied area
q_{des}	W/m^2	Design heat flux
q_G	W/m^2	Limit heat flux
q_N	W/m^2	Nominal heat flux
q_R	W/m^2	Heat flux in the peripheral area
q_u	W/m^2	Outward heat flux
R_o	$m^2 \cdot K/W$	Partial inwards heat transmission resistance of surface structure
R_u	$m^2 \cdot K/W$	Partial outwards heat transmission resistance of surface structure
$R_{\lambda,B}$	$m^2 \cdot K/W$	Thermal resistance of surface covering

$R_{\lambda,ins}$	$m^2 \cdot K/W$	Thermal resistance of thermal insulation
s_h	m	In Type B systems, thickness of thermal insulation from the outward edge of the insulation to the inward edge of the pipes (see Figure 2)
s_l	m	In Type B systems, thickness of thermal insulation from the outward edge of the insulation to the outward edge of the pipes (see Figure 2)
s_{ins}	m	Thickness of thermal insulation
s_R	m	Pipe wall thickness
s_u	m	Thickness of the layer above the pipe
s_{WL}	m	Thickness of heat conducting device
S	m	Thickness of the screed (excluding the pipes in type A systems)
W	m	Pipe spacing
α	$W/(m^2 \cdot K)$	Heat exchange coefficient
$\theta_{s,max}$	°C	Maximum surface temperature
$\theta_{s,min}$	°C	Minimum surface temperature
θ_i	°C	Design indoor temperature
θ_m	°C	Temperature of the heating/cooling medium
θ_R	°C	Return temperature of heating/cooling medium
θ_V	°C	Supply temperature of heating/cooling medium
θ_u	°C	Indoor temperature in an adjacent space
$\Delta\theta_H$	K	Heating/cooling medium differential temperature
$\Delta\theta_{H,des}$	K	Design heating/cooling medium differential temperature
$\Delta\theta_{H,G}$	K	Limit of heating/cooling medium differential temperature
$\Delta\theta_N$	K	Nominal heating/cooling medium differential temperature
$\Delta\theta_V$	K	Heating/cooling medium differential supply temperature
$\Delta\theta_{V,des}$	K	Design heating/cooling medium differential supply temperature
λ	W/(m·K)	Thermal conductivity
σ	K	Temperature drop $\theta_V - \theta_R$
φ	—	Conversion factor for temperatures
ψ	—	Content by volume of the attachment burrs in the screed

5 Concept of the method to determine the heating and cooling capacity

A given type of surface (floor, wall, ceiling) delivers, at a given average surface temperature and indoor temperature (operative temperature θ_i), the same heat flux in any space independent of the type of embedded system. It is therefore possible to establish a basic formula or characteristic curve for cooling and a basic formula or characteristic curve for heating, for each of the type of surfaces (floor, wall, ceiling), independent of the type of embedded system, which is applicable to all heating and cooling surfaces (see Clause 6).

Two methods are included in this part of ISO 11855:

— simplified calculation methods depending on the type of system (see Clause 7);

— Finite Element Method and Finite Difference Method (see Clause 8).