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Byggnaders energiprestanda – Metod för beräkning av dimensionerande värmebehov – Del 1: Värmebelastning för rum. Modul M3-3

Energy performance of buildings – Method for calculation of the design heat load – Part 1: Space heating load, Module M3-3

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Europastandarden EN 12831-1:2017 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 12831-1:2017.

Denna standard ersätter SS-EN 12831, utgåva 1.

The European Standard EN 12831-1:2017 has the status of a Swedish Standard. This document contains the official version of EN 12831-1:2017.

This standard supersedes the Swedish Standard SS-EN 12831, edition 1.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12831-1

July 2017

ICS 91.140.10

Supersedes EN 12831:2003

English Version

Energy performance of buildings - Method for calculation of the design heat load - Part 1: Space heating load, Module M3-3

Performance énergétique des bâtiments - Méthode de calcul de la charge thermique nominale - Partie 1 : Charge de chauffage des locaux, module M3-3

Energetische Bewertung von Gebäuden - Verfahren zur Berechnung der Norm-Heizlast - Teil 1: Raumheizlast, Modul M3-3

This European Standard was approved by CEN on 27 February 2017.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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European foreword

This document (EN 12831-1:2017) has been prepared 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of an identical text or by endorsement, at the latest by January 2018, and conflicting national standards shall be withdrawn at the latest by January 2018.

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

This document supersedes EN 12831:2003.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

EN 12831, *Energy performance of buildings — Method for the calculation of the design heat load*, is composed with the following parts:

— *Part 1: Space heating load, Module M3-3*;

— *Part 2: Explanation and justification of EN 12831-1, Module M3-3* [CEN/TR];

— *Part 3: Domestic hot water systems heat load and characterisation of needs, Module M8-2, M8-3*;

— *Part 4: Explanation and justification of EN 12831-3, Module M8-2, M8-3* [CEN/TR].

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, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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Introduction

This European Standard is part of a series of standards aiming at international harmonization of the methodology for the assessment of the energy performance of buildings, called “set of EPB standards”.

All EPB standards follow specific rules to ensure overall consistency, unambiguity and transparency.

All EPB standards provide a certain flexibility with regard to the methods, the required input data and references to other EPB standards, by the introduction of a normative template in Annex A and Annex B with informative default choices.

For the correct use of this standard a normative template is given in Annex A to specify these choices. Informative default choices are provided in Annex B.

The EPB set of standards deals with energy performance calculation and other related aspects (like system sizing) to provide the building services considered in the EPBD.

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.

Use by or for regulators: In case the standard is used in the context of national or regional legal requirements, mandatory choices may be given at national or regional level for such specific applications. These choices (either the informative default choices from Annex B or choices adapted to national / regional needs, but in any case following the template of this Annex A) can be made available as national annex or as separate (e.g. legal) document (national data sheet).

NOTE So in this case:

— the regulators will **specify** the choices;

— the individual user will apply the standard to assess the energy performance of a building, and thereby **use** the choices made by the regulators.

Topics addressed in this standard can be subject to public regulation. Public regulation on the same topics can override the default values in Annex B of this standard. Public regulation on the same topics can even, for certain applications, override the use of this standard. Legal requirements and choices are in general not published in standards but in legal documents. In order to avoid double publications and difficult updating of double documents, a national annex may refer to the legal texts where national choices have been made by public authorities. Different national annexes or national data sheets are possible, for different applications.

It is expected, if the default values, choices and references to other EPB standards in Annex B are not followed due to national regulations, policy or traditions, that:

— national or regional authorities prepare data sheets containing the choices and national or regional values, according to the model in Annex A. In this case the national annex (e.g. NA) refers to this text;

— or, by default, the national standards body will consider the possibility to add or include a national annex in agreement with the template of Annex A, in accordance to the legal documents that give national or regional values and choices.

Further target groups are parties wanting to motivate their assumptions by classifying the building energy performance for a dedicated building stock.

More information is provided in the Technical Report accompanying this standard (CEN/TR 12831-2).

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1 Scope

This European Standard covers methods for the calculation of the design heat load for single rooms, building entities and buildings, where the design heat load is defined as the heat supply (power) needed to maintain the required internal design temperature under design external conditions.

Table 1 shows the relative position of this standard within the set of EPB standards in the context of the modular structure as set out in EN ISO 52000-1.

NOTE 1 In CEN ISO/TR 52000-2 the same table can be found, with, for each module, the numbers of the relevant EPB standards and accompanying technical reports that are published or in preparation.

NOTE 2 The modules represent EPB standards, although one EPB standard may cover more than one module and one module may be covered by more than one EPB standard, for instance a simplified and a detailed method respectively. See also Clause 2 and Tables A.1 and B.1.

Table 1 — Position of this standard, within the modular structure of the set of EPB standards

	Overarching		Building (as such)		Technical Building Systems									
Sub module	**Descriptions**		**Descriptions**		**Descriptions**	**Heating**	**Cooling**	**Ventilation**	**Humidification**	**Dehumidification**	**Domestic Hot water**	**Lighting**	**Building automation and control**	**Electricity production**
sub1		**M1**		**M2**		**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**
1	General		General		General	15316–1					15316–1			
2	Common terms and definitions; symbols, units and subscripts		Building Energy Needs		Needs						12831–3			
3	Applications		(Free) Indoor Conditions without Systems		Maximum Load and Power	**12831–1**					12831–3			
4	Ways to Express Energy Performance		Ways to Express Energy Performance		Ways to Express Energy Performance	15316–1					15316–1			
5	Building categories and Building Boundaries		Heat Transfer by Transmission		Emission and control	15316–2	15316–2							
6	Building Occupancy and Operating Conditions		Heat Transfer by Infiltration and Ventilation		Distribution and control	15316–3	15316–3				15316–3			

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	Overarching		Building (as such)		Technical Building Systems									
Sub module	**Descriptions**		**Descriptions**		**Descriptions**	**Heating**	**Cooling**	**Ventilation**	**Humidification**	**Dehumidification**	**Domestic Hot water**	**Lighting**	**Building automation and control**	**Electricity production**
sub1		**M1**		**M2**		**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**
7	Aggregation of Energy Services and Energy Carriers		Internal Heat Gains		Storage and control	15316–5					15316–5 15316–4–3			
8	Building zoning		Solar Heat Gains		Generation									
8–1					Combustion boilers	15316–4–1					15316–4–1			
8–2					Heat pumps	15316–4–2	15316–4–2				15316–4–2			
8–3					Thermal solar Photovoltaics	15316–4–3					15316–4–3			15316–4–3
8–4					On-site cogeneration	15316–4–4					15316–4–4			15316–4–4
8–5					District heating and cooling	15316–4–5	15316–4–5							15316–4–5
8–6					Direct electrical heater	15316–4–8					15316–4–8			
8–7					Wind turbines									15316–4–10
8–8					Radiant heating, stoves	15316–4–8								

	Overarching		Building (as such)		Technical Building Systems									
Sub module	**Descriptions**		**Descriptions**		**Descriptions**	**Heating**	**Cooling**	**Ventilation**	**Humidification**	**Dehumidification**	**Domestic Hot water**	**Lighting**	**Building automation and control**	**Electricity production**
sub1		**M1**		**M2**		**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**
9	Calculated Energy Performance		Building Dynamics (thermal mass)		Load dispatching and operating conditions									
10	Measured Energy Performance		Measured Energy Performance		Measured Energy Performance	15378–3					15378–3			
11	Inspection		Inspection		Inspection	15378–1					15378–1			
12	Ways to Express Indoor Comfort			–	BMS									
13	External Environment Conditions													
14	Economic Calculation	15459–1												
NOTE The shaded modules are not applicable.														

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2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 6946, *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method (ISO 6946)*

EN ISO 7345, *Thermal insulation — Physical quantities and definitions (ISO 7345)*

EN ISO 9972, *Thermal performance of buildings — Determination of air permeability of buildings — Fan pressurization method (ISO 9972)*

EN ISO 10077-1, *Thermal performance of windows, doors and shutters — Calculation of thermal transmittance — Part 1: General (ISO 10077-1)*

EN ISO 13370, *Thermal performance of buildings — Heat transfer via the ground — Calculation methods (ISO 13370)*

EN ISO 13789, *Thermal performance of buildings — Transmission and ventilation heat transfer coefficients — Calculation method (ISO 13789)*

EN ISO 52000-1, *Energy performance of buildings — Overarching EPB assessment — Part 1: General framework and procedures (ISO 52000-1)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 7345 and EN ISO 52000-1, and the following apply.

3.1
ATD, air terminal device
air out-/inlets allowing air transfer between external and internal air (*external ATD*) or between separate rooms (*internal ATD*)

Note 1 to entry: In the field, the term *ATD* is used for a broad variety of air out- and inlets. Within this standard, the term refers only to passive devices allowing air flow through a building element (walls, etc.) in a defined manner. It does not include air out-/inlets of fan-assisted ventilation system.

Note 2 to entry: Within this standard, it is assumed that external ATDs are only applied in unbalanced ventilation.

3.2
annual mean external temperature
mean value of the external temperature during the year

3.3
balanced ventilation
fan-assisted ventilation where the sum of all supply air volume flows equals the sum of all exhausted air volume flows in quantity and over the course of time

3.4
building element
internal or external component of the building structure and/or thermal envelope or a portion thereof with uniform thermal conditions on each side of the element

EXAMPLE Wall between two rooms of the same or different temperatures.

3.5
building entity
certain portion of a building (one or more rooms) used as one unit by one party/occupant, such as:

— one apartment / flat;

— one office unit…

where the heat supply to that unit can be controlled individually by the occupant (usually by means of room temperature control devices)

Note 1 to entry: For the definition of *building entities* within application of this standard, it is not relevant if the heat supplied to *building entities* is generated centralized per building or separately in each *building entity*.

3.6
design heat load
heat flow (power) required to achieve the specified internal design temperature under external design conditions

Note 1 to entry: The *design heat load* covers transmission and ventilation heat losses and, if any, an additional heating-up power.

3.7
design heat loss
heat loss (power) leaving the building to the external environment under specified design conditions

3.8
design transmission heat loss
heat loss to the exterior and between heated and other heated or unheated spaces inside a building as a result of thermal conduction through the surrounding surfaces

Note 1 to entry: The design transmission heat loss is a portion of the design heat loss.

3.9
design ventilation heat loss
heat loss to the exterior by ventilation and infiltration through the building envelope and the heat transferred by ventilation from one heated space to another heated or unheated space

Note 1 to entry: The design ventilation heat loss is a portion of the design heat loss.

3.10
external design temperature
(minimal) external air temperature which is used for the calculation of the design heat losses

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3.11
heated space
space which, per design, is heated to the specified internal design temperature and separated from other spaces by building elements such as walls, etc.

Note 1 to entry: Usually each single (heated) room is considered a heated space.

3.12
internal air temperature
temperature of the air inside the considered heated space

3.13
internal design temperature
temperature-value required for the intended use of a heated space and that is used to calculate the design heat loss

Note 1 to entry: The internal design temperature is an operative temperature and, therefore, depends, among other parameters, on the air temperature and the radiant temperature – usually defined in a simplified manner as arithmetic average between both.

Note 2 to entry: Default values for the internal design temperature are subject to national regulations.

3.14
large openings
openings of the enveloping surface of a room/building that are kept open for significant periods over the day on a regular basis; usually, but not necessarily, (large) doors or gates

EXAMPLE Gates in logistics and industrial halls.

3.15
mean internal air temperature
mean air temperature of a heated space

Note 1 to entry: With low room heights (h < 4 m), the *mean internal air temperature* can be assumed to equal the *internal design temperature*; with larger room heights, the *mean internal air temperature* is calculated based on the *internal design temperature*, specifically for the heating system to be used.

3.16
mean internal surface temperature
mean temperature of a building element's inner surface

Note 1 to entry: With low room heights (h < 4 m), the *mean internal surface temperature* can be assumed to equal the *internal design temperature*; with larger room heights, the *mean internal surface temperature* is calculated based on the *internal design temperature*, specifically for the heating system to be used.

3.17
minimum air change rate
number of air changes per hour that needs to be ensured in order to maintain an appropriate level of air hygiene (reduction of air pollutants, CO_2, moisture, etc.), which depends on type of the room (use); subject to national regulation

3.18
regularly unheated space
space that, by design, is unheated; e.g. unheated attic, unheated corridor, unheated winter garden, etc.

Note 1 to entry: Within this standard, adjacent building entities (neighbouring apartment, etc.) are, for calculational purposes, assumed to be unheated – these, however, do not belong to *regularly unheated spaces*.

3.19
unbalanced ventilation
fan-assisted ventilation where the sums of all supply air volume flows and all exhausted air volume flows differ significantly in quantity or over the course of time

3.20
ventilation
entirety of all processes transporting air, including fan-assisted ventilation by ventilation systems, natural ventilation ("airing"), infiltration through leakages, etc.

3.21
zone (ventilation zone)
group of rooms that are air-connected by design, either directly or indirectly (through other rooms there between); e.g. through internally mounted air transfer devices / shortened door leafs, etc.

Note 1 to entry: By design, there is no air transfer between *ventilation zones*. Usually, each *building entity* is considered a separate *zone*.

4 Symbols and abbreviations

4.1 Symbols

For the purposes of this document, the symbols given in EN ISO 52000-1 and the specific symbols listed in Table 2 apply.

Table 2 — Symbols and units

Symbol	Name	Unit
Φ	Heat power (heat loss, heat load)	W
H	Heat transfer coefficient	W/K
θ	Temperature on the Celsius scale	°C
U	Thermal transmittance, U-value	$W/(m^2 \cdot K)$
f	Adjustment/correction factor or term	-
Δ...	Delta/difference	-
A	Area	m^2
a, b, c	Calculation parameters	-
B'	Geometric parameter of the floor slab	m
z	Depth of the floor slab below ground level	m
P	Exposed periphery of the floor slab	m
$n_{1...3}$	Calculation parameters (exponent)	-