
Energijske lastnosti stavb - Metoda za izračun energijskih zahtev in učinkovitosti sistema - 5. del: Sistemi za ogrevanje prostora in shranjevanje tople sanitarne vode (brez hlajenja) - Modula M3-7 in M8-7

Energy performance of buildings - Method for calculation of system energy requirements and system efficiencies - Part 5: Space heating and DHW storage systems (not cooling), Module M3-7, M8-7

Energetische Bewertung von Gebäuden - Verfahren zur Berechnung der Energieanforderungen und Nutzungsgrade der Anlagen Teil 5: Raumheizung und Speichersysteme für erwärmtes Trinkwasser (keine Kühlung), Modul M3-7, M8-7

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Performance énergétique des bâtiments - Méthode de calcul des besoins énergétiques et des rendements des systèmes - Partie 5 : Systèmes de stockage pour le chauffage et l'eau chaude sanitaire (sans refroidissement), Module M3-7, M8-7

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91.140.65	Oprema za ogrevanje vode	Water heating equipment

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**Energy performance of buildings - Method for calculation
of system energy requirements and system efficiencies -
Part 5: Space heating and DHW storage systems (not
cooling), Module M3-7, M8-7**

Performance énergétique des bâtiments - Méthode de
calcul des besoins énergétiques et des rendements des
systèmes - Partie 5 : Systèmes de stockage pour le
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Energetische Bewertung von Gebäuden - Verfahren zur
Berechnung der Energieanforderungen und
Nutzungsgrade der Anlagen - Teil 5: Raumheizung und
Speicher für erwärmtes Trinkwasser (keine Kühlung),
Modul M3-7, M8-7

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European foreword

This document (EN 15316-5:2017) 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of an identical text or by endorsement, at the latest by November 2017 and conflicting national standards shall be withdrawn at the latest by November 2017.

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

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.

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

This standard specifies two methods to take into account the energy performance of storage systems for heating of domestic hot water coupled to generation system(s) producing hot water or using independent energy input to the storage unit. This standard presents two methods applicable to the different technologies of water based storage system and related controls systems:

- method A applies when the hot water is thermally stratified;
- method B applies when the hot water contained in the storage unit(s) is thermally homogeneous.

The standard covers typically hourly time-step but can be adapted to different time steps accordingly with the scenarios used for energy use and energy delivered.

The subjects covered by CEN/TC 228 are the following:

- design of heating systems (water based, electrical etc.);
- installation of heating systems; [SIST EN 15316-5:2018](https://standards.iteh.ai/catalog/standards/sist/aca13490-02eb-4497-97dc-cb64bd846b66/sist-en-15316-5-2018)
- commissioning of heating systems; <https://standards.iteh.ai/catalog/standards/sist/aca13490-02eb-4497-97dc-cb64bd846b66/sist-en-15316-5-2018>
- 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.

For the correct use of this standard, Annex A is to be used to specify the choices with the required input data for use with method A (hourly calculation time step) or Method B (other calculation time steps). Default values for use of the Method A and B monthly and annual methods are provided in Annex B. 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, in particular for the application within the context of EU Directives transposed into national legal requirements. These choices can be made available as National Annex or as separate (e.g. legal) document. It is expected, if the default values and choices in Annex A are not followed due to national regulations, policy or traditions, that:

- either the national standardization body will consider the possibility to add or include a National Annex in agreement with the template of Annex A;
- or the national or regional authorities will, in the building regulations, reference the standard and prepare data sheets containing the national or regional choices and values, in agreement with the template of Annex A.

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.

Table 1 shows the relative position of this standard within the EPB standards.

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EN 15316-5:2017 (E)

1 Scope

This European Standard covers energy performance calculation of water based storage sub-systems used for heating, for domestic hot water or for combination of these.

This standard does not cover sizing or inspection of such storage systems.

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 1	Descriptions	M1	sub 1	Descriptions	sub 1	Descriptions	Heating	Cooling	Ventilation	Humidification	Dehumidification	Domestic Hot water	Lighting	Building automation & control	Electricity production
1	General		1	General	1	General	15316-1					15316-1			
2	Common terms and definitions; symbols, units and subscripts		2	Building Energy Needs	2	Needs						12831-3			
3	Applications		3	(Free) Indoor Conditions without Systems	3	Maximum Load and Power	12831-1					12831-3			
4	Ways to Express Energy Performance		4	Ways to Express Energy Performance	4	Ways to Express Energy Performance	15316-1					15316-1			
5	Building Functions and Building Boundaries		5	Heat Transfer by Transmission	5	Emission and control	15316-2	15316-2							
6	Building Occupancy and Operating Conditions		6	Heat Transfer by Infiltration and Ventilation	6	Distribution and control	15316-3	15316-3				15316-3			
7	Aggregation of Energy Services and Energy Carriers		7	Internal Heat Gains	7	Storage and control	15316-5					15316-5			

Overarching			Building (as such)		Technical Building Systems										
	Descriptions			Descriptions		Descriptions	Heating	Cooling	Ventilation	Humidification	Dehumidification	Domestic Hot water	Lighting	Building automation & control	Electricity production
sub 1		M1	sub 1	M2	sub 1		M3	M4	M5	M6	M7	M8	M9	M10	M11
8	Building Partitioning		8	Solar Heat Gains	8	Generation									
					8-1	Combustion boilers	15316-4-1					15316-4-1			
					8-2	Heat pumps	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			15316-4-5
					8-6	Direct electrical heater	15316-4-9					15316-4-6			
					8-7	Wind turbines	15316-4-10								15316-4-7
					8-8	Radiant heating, stoves	15316-4-8								
9	Calculated Energy Performance		9	Building Dynamics (thermal mass)	9	Load dispatching and operating conditions									
10	Measured Energy Performance		10	Measured Energy Performance	10	Measured Energy Performance	15378-3					15378-3			
11	Inspection		11	Inspection	11	Inspection	15378-1					15378-1			
12	Ways to Express Indoor Comfort		12	-	12	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 15316-1, *Energy performance of buildings - Method for calculation of system energy requirements and system efficiencies - Part 1: General and Energy performance expression, Module M3-1, M3-4, M3-9, M8-1, M8-4*

EN 15316-3, *Energy performance of buildings - Method for calculation of system energy requirements and system efficiencies - Part 3: Space distribution systems (DHW, heating and cooling), Module M3-6, M4-6, M8-6*

EN ISO 7345:1995, *Thermal insulation - Physical quantities and definitions (ISO 7345:1987)*

EN ISO 52000-1:2017, *Energy performance of buildings - Overarching EPB assessment - Part 1: General framework and procedures (ISO 52000-1:2017)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 7345:1995 and EN ISO 52000-1:2017 and the following apply.

- 3.1**
electric storage water heater
ESWH
 storage water heater powered with electricity and used for domestic hot water energy use
- 3.2**
double service storage water heater
DSWH
 storage water heater used for both heating and domestic hot water energy use
- 3.3**
heat exchanger storage water heater
HESWH
 storage water heater using internal heat exchanger to store the energy provided by an external generation system (solar, boiler, heat pump,...)
- 3.4**
multi energy storage water heater
MESWH
 storage water heater using different energy sources to store the energy
- 3.5**
thermodynamic storage water heater
TSWH
 storage water heater using attached heat pump system to produce and store hot water

4 Symbols and abbreviations

4.1 Symbols

For the purposes of this document, the symbols given in EN ISO 52000-1 apply.

4.2 Subscripts

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

Table 2 —Subscripts

Subscript	Term
Bu	Back-up
Ref	Reference
stby	Stand-by
cold	Cold

5 Description of the methods

5.1 Output of the method

This method covers the calculation of energy delivered to the storage system, energy delivered from the storage systems to the domestic and hot water distribution system, auxiliary energy and thermal losses (recoverable or not) of storage systems used for heating and/or domestic hot water.

The time step of the output can be: [iteh.ai/catalog/standards/sist/aca13490-02eb-4497-97dc-cb64bd846b66/sist-en-15316-5-2018](https://www.iteh.ai/catalog/standards/sist/aca13490-02eb-4497-97dc-cb64bd846b66/sist-en-15316-5-2018)

- hourly;
- bin;
- yearly;
- monthly,

according to the scenarios used to determine the thermal load.

5.2 Extension of the method

The method which is presented in the standard can be extended to storage systems with multiple storage units.

The adaptation depends of the hydraulic schema used for the design of the storage system:

- serial mounting – the storage units are hydraulically linked as the output of the storage unit 'n' become the input of the storage unit 'n+1'. The equations as identical as the calculation procedure will consider a loop for all storage unit to calculate the total energy stored, the energy used and delivered and the corresponding volume of hot water delivered to the system;
- parallel mounting – the regulation systems sets the priority for the storage units that are considered independently.

EN 15316-5:2017 (E)**5.3 Technologies covered and schematisation of the hot water storage system**

The following storage units and control systems are covered:

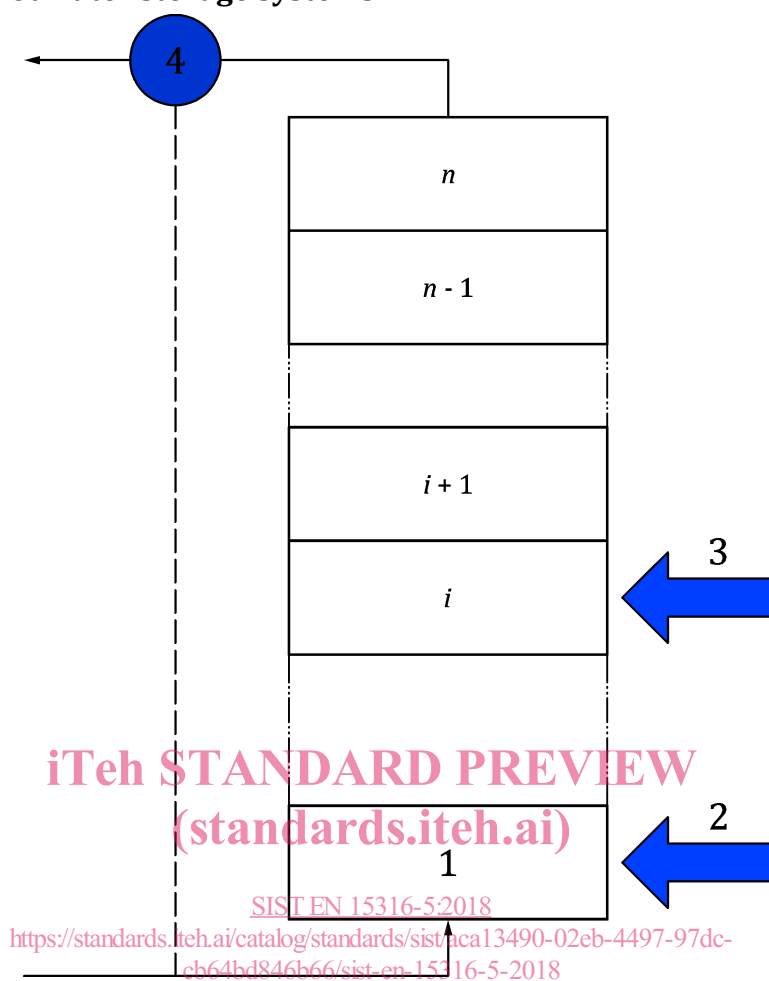
- Storage units (with or without primary circuit);
- Control system of the output water:
 - based on availability of energy delivered to the storage unit(s);
 - priority given to domestic hot water, then heating (default);
 - type of power unit (direct, heat exchanger, ...) and position in the storage unit.

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5.4 Principles for hot water storage systems

**Key**

1	layer 1	i+1	layer i+1
2	energy input	n-1	layer n-1
3	energy input	n	layer n – number of layers
i	layer i	4	mixing valve

Figure 1 — General model of the storage unit