SLOVENSKI STANDARD
SIST EN 15316-4-1:2018

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Nadomešča:
SIST EN 15316-3-3:2007
SIST EN 15316-4-1:2008
SIST EN 15316-4-7:2009

Energijske lastnosti stavb - Metoda za izračun energijskih zahtev in učinkovitosti sistema - 4-1. del: Sistemi za pridobivanje toplote za ogrevanje in pripravo tople sanitarne vode, kurilne naprave (kotli, biomasa) - Modula M3-8-1 in M8-8-1

Energy performance of buildings - Method for calculation of system energy requirements and system efficiencies - Part 4-1: Space heating and DHW generation systems, combustion systems (boilers, biomass), Module M3-8-1, M8-8-1

Energetische Bewertung von Gebäuden - Verfahren zur Berechnung der Energieanforderungen und Nutzungsgrade der Anlagen - Teil 4-1: Wärmeerzeugung für die Raumheizung und Trinkwassererwärmung, Verbrennungssysteme (Heizungskessel, Biomasse), Modul M3-8-1, M8-8-1

Performance énergétique des bâtiments - Méthode de calcul des besoins énergétiques et des rendements des systèmes - Partie 4-1 : Systèmes de génération de chauffage des locaux et production d'eau chaude sanitaire, systèmes de combustion (chaudières, biomasse), Module M3-8-1, M8-8-1

Ta slovenski standard je istoveten z: EN 15316-4-1:2017

ICS:

91.140.10	Sistemi centralnega ogrevanja	Central heating systems
91.140.65	Oprema za ogrevanje vode	Water heating equipment

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 15316-4-1

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ICS 91.140.10; 91.140.65

Supersedes EN 15316-3-3:2007, EN 15316-4-1:2008,
EN 15316-4-7:2008

English Version

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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 COMMITTEE FOR STANDARDIZATION
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European foreword

This document (EN 15316-4-1:2017) 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 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.

This document supersedes EN 15316-3-3:2007, EN 15316-4-1:2008, EN 15316-4-7:2008.

In case this 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.

Further target groups are users of the voluntary common European Union certification scheme for the energy performance of non-residential buildings (EPBD art.11.9) and any other regional (e.g. Pan European) parties wanting to motivate their assumptions by classifying the building energy performance for a dedicated building stock.

The main changes compared to EN 15316-3-3:2007, EN 15316-4-1:2008 and EN 15316-4-7:2008 are:

a) the typology method was removed;

b) the boiler cycling method has been added for existing boilers to get the input parameters for the case specific boiler efficiency method.

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.

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 "EPB set of standards".

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

CEN/TC 228 deals with heating systems in buildings. Subjects covered by CEN/TC 228 are:

— energy performance calculation for heating systems;

— inspection of heating systems;

— design of heating systems;

— installation and commissioning of heating systems.

This standard is intended to replace EN 15316-3-3:2007, EN 15316-4-1:2008 and EN 15316-4-7:2008 and includes biomass boilers (former EN 15316-4-7:2008). This revision was required as a result of the EPBD recast (2010/31/EU). The set of standards developed under mandate M/343 will be revised to become consistent with the overarching standard under mandate M/480.

Other generation systems are covered in other sub modules of part M3-8 (see Table 1).

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 main target group of this standard are all the users of the set of EPB standards (e.g. architects, engineers, regulators).

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, in particular for the application within the context of EU Directives transposed into national legal requirements. 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.

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, for certain applications, 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, the National Annex may refer to the legal texts where national choices have been made by public authorities.

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It is expected, if the default values and choices 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 users of the voluntary common European Union certification scheme for the energy performance of non-residential buildings (EPBD art.11.9) and any other Pan EU 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 15316-6-4).

1   Scope

This European Standard is part of a series of standards on the method for calculation of system energy requirements and system efficiencies of space heating systems and domestic hot water systems.

This standard (EN 15316-4-1) specifies:

— required inputs;

— a calculation method;

— resulting outputs;

— a method to take into account the energy performance of heat generation devices based on fuel combustion;

for space heating generation by combustion sub-systems (boilers, biomass), including control.

This standard specifies methods for the calculation of:

— thermal losses from the heating and the domestic hot water generation system;

— recoverable thermal losses for space heating from the heating and the domestic hot water generation system;

— auxiliary energy of the heating and the domestic hot water generation systems.

This standard specifies the energy performance calculation of water based heat generation sub-systems including control based on combustion of fuels ("boilers"), operating with conventional fossil fuels as well as renewable fuels. This standard does not cover sizing or inspection of boilers.

This standard is also applicable to heat generators for heating or for combined service as domestic hot water, ventilation, cooling and heating. Generators for domestic hot water only are taken into account into part M8-8.

This European Standard is the general standard on generation by combustion sub-systems (boilers, biomass) and is also intended for generation for domestic hot water production and/or space heating. These values are input data for calculation of the overall energy use according to EN ISO 52000-1 and EN 15316-1.

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.

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Table 1 — Position of EN 15316–4-1 within the modular structure

Overarching			Building (as such)		Technical Building Systems										
	Descriptions			Descriptions		Descriptions	Heating	Cooling	Ventilation	Humidification	Dehumidification	Domestic Hot water	Lighting	Building automation and control	Electricity production
sub1		M1	sub1	M2	sub1		M3	M4	M5	M6	M7	M8	M9	M10	M11
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 15316–4-3			
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				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	15316–4-6					15316–4-6			
					8–7	Wind turbines									15316–4- 10
					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													

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 89, *Gas-fired storage water heaters for the production of domestic hot water*

EN ISO 13790, *Energy performance of buildings — Calculation of energy use for space heating and cooling (ISO 13790)*

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 52000-1 and the following apply.

3.1
heat transfer coefficient
factor of proportionality of heat flow governed by a temperature difference between two environments

3.2
boiler
gas, liquid or solid fuelled appliance designed to provide hot water for space heating

3.3
combustion power
product of the fuel flow rate and the net calorific power of the fuel

3.4
low temperature boiler
non-condensing boiler which can work continuously with a water supply temperature of 35 to 40°C, possibly producing condensation in certain circumstances

3.5
condensing boiler
boiler in which, under normal operating conditions and at certain operating water temperatures, the water vapour in the combustion products is partly condensed, in order to make use of the latent heat of this water vapour for heating purposes

Note 1 to entry: Boilers not designed to or without the means to remove the condensate in liquid form, are called 'non-condensing'.

[SOURCE: EN 15502-1:2012+A1:2015, 3.1.10.2, modified - Note 1 to entry has been added.]

[SOURCE: EN 15034:2006, 3.4, modified – Slight different drafting and Note 1 to entry have been added.]

3.6
modes of operation
various modes in which the heating system can operate

EXAMPLE   Set-point mode, cut-off mode, reduced mode, set-back mode, boost mode.

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3.7
on/off boiler
boiler without the capability to vary the fuel burning rate whilst maintaining continuous burner firing

Note 1 to entry: This includes boilers with alternative burning rates set once only at the time of installation, referred to as range rating

3.8
multistage boiler
boiler with the capability to vary the fuel burning rate stepwise whilst maintaining continuous burner firing

3.9
modulating boiler
boiler with the capability to vary continuously (from a set minimum to a set maximum) the fuel burning rate whilst maintaining continuous burner firing

3.10
biomass boiler
biomass fuelled appliance designed to provide heating medium (e.g. water, fluid)

3.11
load factor
ratio between the time with the boiler ON (burner 100%) and the total generator operation time

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3.12
operation cycle
(standards.iteh.ai)
time period of the operation cycle of a boiler

3.13
standard condition
condition of 15 °C, 1 013,25 mbar, if there are no other information

4   Symbols and abbreviations

4.1 Symbols

For the purposes of this document, the symbols and indices of EN ISO 52000-1 and the symbols and units of Table 2 applies.

Table 2 — Symbols and units

Symbol	Name of quantity	Unit
D	day	d/mth
h	specific latent heat	kJ/kg or Wh/kg
α	Heat transfer coefficient	W/(m^2 K)
β	load factor	-
ε	expenditure factor	-
ϑ	Temperature	°C

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4.2 Abbreviations and indices

For the purposes of this document, the symbols and indices of EN ISO 52000-1 and the indices of Table 3 applies.

Table 3 — Indices

Hc	Heating circuit	ch	chimney	prio	priority
O_2	Oxygen	cond	condensation	s	gross
H_2O	humidity	corr	corrected/correction	sat	saturation
Pn	at nominal load	dry	dry gases	sim	simultaneous
Pint	at intermediate load	env	envelope	sink	sink
P0	at zero load	fg	flue gas	st	stoichiometric
Px	Actual load	i	net	test	test
RT	Return	mech	mechanical (ventilation system)	tr	transmission
Hs/Hi	Ratio of gross calorific/net calorific value	n	radiator index, nominal	ve	ventilation
add	additional	op	operational	wfg	water in flue gas
air	Air	ref	Reference	Xc	Circuit of any considered building system
brm	boiler room	pa	partial area	S	storage

5 Description of the method

5.1 Output of the method

For output quantities see Table 4

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Table 4 — Output quantities

Description	Symbol	Unit	Calculation sub-clause	Validity interval	Destination module	Varying
Fuel heat input	$E_{gen;in}$	kWh	see 6.2	0...∞	M 3–1	YES
Recoverable generation heat losses for heating system (in the calculation interval)	$Q_{gen;ls;rbl}$	kWh	see 6.5	0...∞	M 3–1	YES
generation heat losses (in the calculation interval)	$Q_{gen;ls;}$	kWh	see 6.4	0...∞	M 3–1	YES
Expenditure factor of the generator for the whole service	ε_{gen}	-	See 6.1	1 - 10	M 3–1	YES
Expenditure factor of the generator for heating	$\varepsilon_{H;gen}$	-	see 6.1	2 - 10	M 3–1	YES
Expenditure factor of the generator for cooling	$\varepsilon_{C;gen}$	-	see 6.1	3 - 10	M 3–1	YES
Expenditure factor of the generator for ventilation	$\varepsilon_{V;gen}$	-	see 6.1	4 - 10	M 3–1	YES
Expenditure factor of the generator for DHW	$\varepsilon_{W;gen}$	-	see 6.1	5 - 10	M 3–1	YES
heat generation auxiliary energy for the heating system (in the calculation interval)	$W_{gen,}$	kWh	see 6.3	0...∞	M 3–1	YES
Fuel type		List		not relevant	M 3–1	NO

5.2 General description of the method

The calculation method of the generation sub-system takes into account heat losses and/or recovery due to the following physical factors:

— heat losses to the chimney (or flue gas exhaust) and through the envelope of the storage tank and the generator(s) during total time of generator operation (running and stand-by);

— auxiliary energy.

The calculation is independent from the time steps.

There are a basic calculation for

— boilers at all (Clause 6.);

— direct heated domestic hot water heaters (6.11) and

— domestic hot water appliance tested with 24 h tapping cycles (6.12).

There are three possibilities inputs for the generation efficiency calculation:

— default values (5.5);

— product values (5.6);

— measured values (5.7).

Default values are given in Annex B.

Product values by the manufactures shall be tested according to the appropriated EN standard (see bibliography).

Measured values are for existing boilers, condensing boilers and on-site inspection.

5.3 Input data

Input quantities from other parts of the heating system standards, see Table 5.

Table 5 — Input quantities

Description	Symbol	Unit	Validity interval	Destination module	Varying
Fuel type	GEN_FUEL	List	not relevant	M 3–4, M 8–4	NO
Generator Type	GEN_TYP	List	not relevant	M 3–4, M 8–4	NO
Burner type	GEN_BURN	List	not relevant	M 3–4, M 8–4	NO
Boiler location	TH_ZONE	List	not relevant	M 3–4, M 8–4	NO
Type of control	HEAT_GEN_CTRL	List	not relevant	M 3–4, M 8–4	NO
Generation circuit typology	GEN_CIRC_TYPOL	List	not relevant	M 3–4, M 8–4	NO
number of dwellings within a building	N_{flat}	-	0...∞	M 3–1	YES
number of peak tappings per day	n_{Sp}	-	0...∞	M 3–1	YES
Heat load	Φ_h	kW	0...∞	M 3–3	YES
Rated output for cooling system	$P_{n,C}$	kW	0...∞	M 4–3	YES
Rated output for ventilation system	$P_{n,V}$	kW	0...∞	M 5–3	YES
Rated output for DHW system	$P_{n,W}$	kW	0...∞	M 8–3	YES
Heat input to the heating distribution system (in the respective time)	$Q_{H,dis;in}$	kWh	0...∞	M 3–6,	Yes
Heat input to the cooling distribution system (in the respective time)	$Q_{C,dis;in}$	kWh	0...∞	M 4–6	YES
Heat input to the ventilation distribution system (in the respective time)	$Q_{V,dis;in}$	kWh	0...∞	M 5–6,	YES
daily energy need for domestic hot water,	$Q_{W,b,d}$	kWh	0...∞	M 8–6	YES
Heat input to the domestic hot water distribution system (in the respective time)	$Q_{W,dis;in}$	kWh	0...∞	M 8–6	YES
Usage period for heating (in the	$t_{H;use}$	h or d	0...8760	M 3–4, M 8–4	YES