

# SVENSK STANDARD

## SS-EN 15316-4-2:2017



Fastställt/Approved: 2017-05-05  
Publicerad/Published: 2017-05-09  
Utgåva/Edition: 2  
Språk/Language: engelska/English  
ICS: 91.140.10

---

**Byggnaders energiprestanda – Metod för beräkning av energibehov och systemeffektivitet –  
Del 4-2: Värme- och tappvarmvattengenererande system, värmepumpbaserade system, Modul M3-8-2, M8-8-2**

**Energy performance of buildings – Method for calculation of system energy requirements and system efficiencies –  
Part 4-2: Space heating generation systems, heat pump systems, Module M3-8-2, M8-8-2**

This preview is downloaded from [www.sis.se](http://www.sis.se). Buy the entire standard via <https://www.sis.se/std-8026260>

# Standarder får världen att fungera

*SIS (Swedish Standards Institute) är en fristående ideell förening med medlemmar från både privat och offentlig sektor. Vi är en del av det europeiska och globala nätverk som utarbetar internationella standarder. Standarder är dokumenterad kunskap utvecklad av framstående aktörer inom industri, näringsliv och samhälle och befrämjar handel över gränser, bidrar till att processer och produkter blir säkrare samt effektiviserar din verksamhet.*

## Delta och påverka

Som medlem i SIS har du möjlighet att påverka framtida standarder inom ditt område på nationell, europeisk och global nivå. Du får samtidigt tillgång till tidig information om utvecklingen inom din bransch.

## Ta del av det färdiga arbetet

Vi erbjuder våra kunder allt som rör standarder och deras tillämpning. Hos oss kan du köpa alla publikationer du behöver – allt från enskilda standarder, tekniska rapporter och standardpaket till handböcker och onlinetjänster. Genom vår webbtjänst e-nav får du tillgång till ett lättnavigerat bibliotek där alla standarder som är aktuella för ditt företag finns tillgängliga. Standarder och handböcker är källor till kunskap. Vi säljer dem.

## Utveckla din kompetens och lyckas bättre i ditt arbete

Hos SIS kan du gå öppna eller företagsinterna utbildningar kring innehåll och tillämpning av standarder. Genom vår närhet till den internationella utvecklingen och ISO får du rätt kunskap i rätt tid, direkt från källan. Med vår kunskap om standarders möjligheter hjälper vi våra kunder att skapa verklig nytta och lönsamhet i sina verksamheter.

**Vill du veta mer om SIS eller hur standarder kan effektivisera din verksamhet är du välkommen in på [www.sis.se](http://www.sis.se) eller ta kontakt med oss på tel 08-555 523 00.**



# Standards make the world go round

*SIS (Swedish Standards Institute) is an independent non-profit organisation with members from both the private and public sectors. We are part of the European and global network that draws up international standards. Standards consist of documented knowledge developed by prominent actors within the industry, business world and society. They promote cross-border trade, they help to make processes and products safer and they streamline your organisation.*

## Take part and have influence

As a member of SIS you will have the possibility to participate in standardization activities on national, European and global level. The membership in SIS will give you the opportunity to influence future standards and gain access to early stage information about developments within your field.

## Get to know the finished work

We offer our customers everything in connection with standards and their application. You can purchase all the publications you need from us - everything from individual standards, technical reports and standard packages through to manuals and online services. Our web service e-nav gives you access to an easy-to-navigate library where all standards that are relevant to your company are available. Standards and manuals are sources of knowledge. We sell them.

## Increase understanding and improve perception

With SIS you can undergo either shared or in-house training in the content and application of standards. Thanks to our proximity to international development and ISO you receive the right knowledge at the right time, direct from the source. With our knowledge about the potential of standards, we assist our customers in creating tangible benefit and profitability in their organisations.

**If you want to know more about SIS, or how standards can streamline your organisation, please visit [www.sis.se](http://www.sis.se) or contact us on phone +46 (0)8-555 523 00**



Europastandarden EN 15316-4-2:2017 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 15316-4-2:2017.

Denna standard ersätter SS-EN 15316-4-2:2008, utgåva 1.

The European Standard EN 15316-4-2:2017 has the status of a Swedish Standard. This document contains the official version of EN 15316-4-2:2017.

This standard supersedes the Swedish Standard SS-EN 15316-4-2:2008, edition 1.

© Copyright/Upphovsrätten till denna produkt tillhör SIS, Swedish Standards Institute, Stockholm, Sverige. Användningen av denna produkt regleras av slutanvändarlicensen som återfinns i denna produkt, se standardens sista sidor.

© Copyright SIS, Swedish Standards Institute, Stockholm, Sweden. All rights reserved. The use of this product is governed by the end-user licence for this product. You will find the licence in the end of this document.

*Upplysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna upplysningar om svensk och utländsk standard.*

*Information about the content of the standard is available from the Swedish Standards Institute (SIS), telephone +46 8 555 520 00. Standards may be ordered from SIS Förlag AB, who can also provide general information about Swedish and foreign standards.*

Denna standard är framtagen av kommittén för Styrning av inomhusmiljö (Installationer), SIS/TK 189/AG 03.

Har du synpunkter på innehållet i den här standarden, vill du delta i ett kommande revideringsarbete eller vara med och ta fram andra standarder inom området? Gå in på [www.sis.se](http://www.sis.se) - där hittar du mer information.



EUROPEAN STANDARD

**EN 15316-4-2**

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 2017

ICS 91.140.10

Supersedes EN 15316-4-2:2008

English Version

**Energy performance of buildings - Method for calculation  
of system energy requirements and system efficiencies -  
Part 4-2: Space heating generation systems, heat pump  
systems, Module M3-8-2, M8-8-2**

Performance énergétique des bâtiments - Méthode de  
calcul des besoins énergétiques et des rendements des  
systèmes - Partie 4-2 : Systèmes de génération de  
chauffage des locaux, systèmes de pompes à chaleur  
Module M3-8-2, M8-8-2

Energetische Bewertung von Gebäuden - Verfahren zur  
Berechnung der Energieanforderungen und  
Nutzungsgrade der Anlagen - Teil 4-2:  
Wärmeerzeugung für die Raumheizung,  
Wärmepumpensysteme, Modul M3-8-2, M8-8-2

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

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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.

CEN members are the national standards bodies of 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 United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

**SS-EN 15316-4-2:2017 (E)**

<b>Contents</b>	<b>Page</b>
European foreword.....	4
Introduction .....	5
<b>1</b> Scope.....	<b>6</b>
<b>2</b> Normative references.....	<b>9</b>
<b>3</b> Terms and definitions .....	<b>9</b>
<b>4</b> Symbols and abbreviations .....	<b>13</b>
4.1 Symbols.....	13
4.2 Subscripts.....	13
<b>5</b> Description of the methods .....	<b>14</b>
5.1 General.....	14
5.2 Multiple heat generators .....	14
5.3 System boundary.....	15
5.3.1 General.....	15
5.3.2 Physical factors taken into account:.....	15
5.4 Schematisation of the heat pump for heating.....	15
5.5 Energy input needed to meet the heat requirements for heat pumps system.....	16
5.6 Auxiliary energy ( $W_{HW;gen;aux}$ ) .....	18
5.7 Recoverable, recovered and unrecoverable heat losses .....	18
5.8 Calculation by zones.....	18
5.9 Combined heating and domestic hot water preparation.....	19
<b>6</b> Generation with heat pump systems - Energy calculation (hourly, bin) - Method A .....	<b>19</b>
6.1 Output data.....	19
6.2 Input data.....	20
6.3 Multiple heat generators .....	26
6.4 Calculation time steps .....	26
6.5 Flow chart .....	26
6.6 Energy requirements for space heating and DHW mode for the time step considered .....	27
6.7 COP and energy used for heating, storage and domestic hot water .....	28
6.8 Auxiliary energy ( $W_{H;gen;aux}$ ) .....	39
6.9 Energy used from the heat source.....	39
6.10 Calculation of back-up heater.....	40
6.11 Total losses and total recoverable heat losses of the generation subsystem.....	40
<b>7</b> Method B - Monthly and annual energy calculation method.....	<b>43</b>
7.1 Calculation time steps .....	43
7.2 Output data.....	43
7.3 Principle of the calculation method B.....	43
7.4 Additional input Data .....	44
7.5 Construction of the bins - Step 1 .....	46
7.6 Determination of energy requirement of the single bins - Step 2 .....	50
7.7 Determination of thermal performance of the heat pump (step 3).....	52
7.8 Determination of back-up energy of the single bins (step 4).....	53
7.9 Calculation of auxiliary energy input (step 5) .....	53

7.10	Calculation of recoverable generation subsystem losses (step 6).....	53
7.11	Calculation of the energy from the heat source (step 7) .....	54
7.12	Calculation of the total driving energy input to cover the requirements (step 8).....	54
8	Quality control.....	54
8.1	Hourly, bin or monthly method.....	54
8.2	Main sources of errors.....	55
9	Compliance check.....	55
Annex A (normative) Template for input data.....		56
A.1	Heat pump description data .....	56
A.2	System design data.....	60
A.3	Operating conditions.....	62
Annex B (informative) Default values.....		64
B.1	Heat pump description data .....	64
B.2	System design data.....	68
B.3	- Operating conditions .....	70
Annex C (informative) Tables of COP and energy at full load.....		72
C.1	General .....	72
C.2	Air – Water electrically driven heat pumps .....	72
C.3	COP and energy for exhaust air/ water electrically driven heat pump .....	73
C.4	COP and energy for water or brine/ water electrically driven heat pump.....	74
C.5	Air/water combustion-engine driven heat pumps.....	75
Annex D (normative) Adaptation of the COP to different conditions of temperature conditions.....		77
D.1	Principle.....	77
D.2	Application to electrically-driven heat pump .....	78
D.3	Application to thermally-driven heat pumps.....	78
D.4	Correction of COP with adaptation to the operational temperature spread .....	79
D.5	Tests results form EN 14825 .....	82
D.6	Input data for the calculation of COP and capacity at operating conditions.....	82
Bibliography .....		84

## SS-EN 15316-4-2:2017 (E)

### European foreword

This document (EN 15316-4-2:2017) 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 document supersedes EN 15316-4-2:2008.

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 October 2017, and conflicting national standards shall be withdrawn at the latest by October 2017.

The revision keeps the main principles of the calculation unchanged but the structure of the document was changed. Informative content was removed to the accompanying technical report CEN/TR 15316-6-2. The provisions cover also other energy carriers than heat now. The values may be altered in a national annex.

Calculation methods to determine energy source indicators like the renewable energy ratio have been added.

The main changes compared to EN 15316-4-2:2008 are:

- a) type of heat pumps are now limited to hot water production at the output of the condenser;
- b) informative content was removed to the accompanying technical report CEN/TR 15316-6-2;
- c) calculation for performance of the heat pumps at different conditions is based on interpolation provisions;
- d) input data for energy performance of the heat pumps are based on part load and/or full load information;
- e) Annex A contains a template for the data and parameters used in the standards and Annex B a set of default values.

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

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.

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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 “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.

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 specifies to take into account the energy performance of heat pump systems used for domestic or heating purpose.

For the correct use of this standard, Annex A is to be used to specify the choices with the required input data. Default values are presented 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.

This updated standard covers hourly, monthly, annual time-steps and temperatures classes (bin method).

**SS-EN 15316-4-2:2017 (E)**

**1 Scope**

This European Standard covers heat pumps for space heating, heat pump water heaters (HPWH) and heat pumps with combined space heating and domestic hot water production in alternate or simultaneous operation, where the same heat pump delivers the heat to cover the space heating and domestic hot water heat requirement.

The standard provides a calculation method under steady conditions that corresponds to one calculation step.

The results of this calculation are incorporated in larger building models and take in account the influence of the external conditions and building control that influence the energy requirements for heating supplied by the heat pump system.

The scope of this part is to standardize the:

- required inputs;
- calculation methods;
- required outputs

Generation for space heating and domestic hot water production of the following heat pump systems, including control of:

- electrically-driven vapour compression cycle (VCC) heat pumps;
- combustion engine-driven vapour compression cycle heat pumps;
- thermally-driven vapour absorption cycle (VAC) heat pumps,

using combinations of heat source and heat distribution listed in Table 1.

**Table 1 — Heating sources and energy distribution**

Source	Distribution
Outdoor air	<b>Water</b>
Exhaust-air	
Indirect ground source with brine	
Indirect ground source with water	
Direct ground source (Direct expansion (DX))	
Surface water	
Ground water	

This standard does not cover sizing or inspection of heat pumps.

This standard deals with heat generators for heating or for combined domestic hot water and heating service. Generators for domestic hot water only are taken into account into module M8-8.

NOTE 1 Heat pumps for cooling systems are taken into account into module M4-8.

NOTE 2 Heat pumps for space heating using air (distribution) are taken into account in module M5-8.

Other generation systems such as boilers are covered in other sub modules of part M3-8.

This is the revision of EN 15316-4-2:2008. The revision covers the adaptation of the standard to hourly and monthly energy calculation.

Table 2 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 3 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 4 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.