

HOONETE ENERGIATÕHUSUS. HOONETE  
VENTILATSIOON. OSA 3: MITTEELUHOONETE  
VENTILATSIOON. ÜLDNÕUDED VENTILATSIOONI- JA  
RUUMIÕHU KONDITSIONEERIMISE SÜSTEEMIDELE  
(MOODULID M5-1, M5-4)

Energy performance of buildings - Ventilation for  
buildings - Part 3: For non-residential buildings -  
Performance requirements for ventilation and  
room-conditioning systems (Modules M5-1, M5-4)

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN 16798-3:2017 sisaldab Euroopa standardi EN 16798-3:2017 ingliskeelset teksti.	This Estonian standard EVS-EN 16798-3:2017 consists of the English text of the European standard EN 16798-3:2017.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 09.08.2017.	Date of Availability of the European standard is 09.08.2017.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile [standardiosakond@evs.ee](mailto:standardiosakond@evs.ee).

ICS 91.120.10, 91.140.30

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:  
Koduleht [www.evs.ee](http://www.evs.ee); telefon 605 5050; e-post [info@evs.ee](mailto:info@evs.ee)

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:

Homepage [www.evs.ee](http://www.evs.ee); phone +372 605 5050; e-mail [info@evs.ee](mailto:info@evs.ee)

English Version

Energy performance of buildings - Ventilation for buildings  
- Part 3: For non-residential buildings - Performance  
requirements for ventilation and room-conditioning  
systems (Modules M5-1, M5-4)

Performance énergétique des bâtiments - Ventilation  
des bâtiments - Partie 3: Pour bâtiments non  
résidentiels - Exigences de performances pour les  
systèmes de ventilation et de climatisation (Modules  
M5-1, M5-4)

Energetische Bewertung von Gebäuden - Lüftung von  
Gebäuden - Teil 3: Lüftung von Nichtwohngebäuden -  
Leistungsanforderungen an Lüftungs- und  
Klimaanlagen und Raumkühlssysteme (Module M5-1,  
M5-4)

This European Standard was approved by CEN on 11 May 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

# Contents

Page

European foreword.....	4
Introduction .....	7
1 Scope.....	9
2 Normative references.....	11
3 Terms and definitions.....	12
4 Symbols and subscripts .....	13
4.1 Symbols.....	13
4.2 Subscripts.....	15
5 Brief description of the method and routing .....	15
5.1 Output of the method.....	15
5.2 General description of the method.....	15
6 Output data for energy calculation.....	16
7 Indoor environment.....	17
7.1 General.....	17
7.2 Occupied zone .....	18
8 Agreement of design criteria .....	20
8.1 General.....	20
8.2 Principles .....	20
8.3 General building characteristics .....	20
8.4 Construction data.....	21
8.5 Geometrical description .....	21
8.6 Use of the rooms.....	21
8.7 Requirements in the rooms.....	22
8.8 System requirements.....	22
8.9 Heat transmission of surfaces of ventilation systems .....	23
8.10 General requirements for control, adjustment and monitoring.....	23
8.11 General requirements for maintenance and safety of operation.....	23
8.12 Process from project initiation to operation .....	24
8.13 Supply air humidity.....	24
9 Classification.....	25
9.1 Specification of types of air.....	25
9.2 Classification of air .....	27
9.3 System functions and basic system types.....	29
9.4 Design air flow balance .....	32
9.5 Specific fan power .....	33
9.6 Heat recovery section.....	37
9.7 Filtration .....	39
9.8 Leakages in ventilation systems .....	40
10 Calculation and energy rating .....	43
10.1 Ventilation effectiveness and air diffusion.....	43

10.2	Calculation of air volume flows .....	44
10.3	Energy rating of ventilation systems.....	45
Annex A (normative) Input and method selection data sheet — Template .....		47
A.1	General .....	47
A.2	References.....	47
A.3	Design data for energy calculation - Typical range for SFP categories .....	48
A.4	Design data.....	48
Annex B (informative) Input and method selection data sheet — Default choices .....		50
B.1	General .....	50
B.2	References.....	50
B.3	Default design data for energy calculation.....	52
B.4	Default design data .....	52
Bibliography .....		55

## European foreword

This document (EN 16798-3:2017) has been prepared by Technical Committee CEN/TC 156 "Ventilation for buildings", the secretariat of which is held by BSI.

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 2018, and conflicting national standards shall be withdrawn at the latest by February 2018.

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 standard has been produced to meet the requirements of Directive 2010/31/EU 19 May 2010 on the energy performance of buildings (recast), referred to as "recast EPBD".

This document supersedes EN 13779:2007, which was produced to meet the requirements of Directive 2002/91/EC 16 December 2002 on energy performance of buildings referred to as "EPBD".

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

For the convenience of Standards users CEN/TC 156, together with responsible Working Group Conveners, have prepared a simple table below relating, where appropriate, the relationship between the 'EPBD' and 'recast EPBD' standard numbers prepared by Technical Committee CEN/TC 156 "Ventilation for buildings".

EPBD EN Number	Recast EPBD EN Number	Title
EN 15251	EN 16798-1	Energy performance of buildings – Ventilation for buildings - Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics (Module M1-6)
N/A	CEN/TR 16798-2	Energy performance of buildings – Ventilation for buildings - Part 2: Interpretation of the requirements in EN 16798-1 — Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics (Module M1-6)
EN 13779	EN 16798-3	Energy performance of buildings – Ventilation for buildings - Part 3: For non-residential buildings – Performance requirements for ventilation and room-conditioning systems (Modules M5-1, M5-4)
N/A	CEN/TR 16798-4	Energy performance of buildings – Ventilation for buildings - Part 4: Interpretation of the requirements in EN 16798-3 — For non-residential buildings – Performance requirements for ventilation and room-conditioning systems (Modules M5-1, M5-4)

EN 15241	EN 16798-5-1	Energy performance of buildings — Ventilation for buildings – Part 5-1: Calculation methods for energy requirements of ventilation and air conditioning systems (Modules M5-6, M5-8, M6-5, M6-8, M7-5, M7-8) — Method 1: Distribution and generation
EN 15241	EN 16798-5-2	Energy performance of buildings – Ventilation for buildings - Part 5-2: Calculation methods for energy requirements of ventilation systems (Modules M5-6.2, M5-8.2) - Method 2: Distribution and generation
N/A	CEN/TR 16798-6	Energy performance of buildings - Ventilation for buildings – Part 6: Interpretation of the requirements in EN 16798-5-1 and EN 16798-5-2 — Calculation methods for energy requirements of ventilation and air conditioning systems (Modules M5-6, M5-8, M 6-5, M6-8, M7-5, M7-8)
EN 15242	EN 16798-7	Energy performance of buildings - Ventilation for buildings - Part 7: Calculation methods for the determination of air flow rates in buildings including infiltration (Module M5-5)
N/A	CEN/TR 16798-8	Energy performance of buildings – Ventilation for buildings – Part 8: Interpretation of the requirements in EN 16798-7 — Calculation methods for the determination of air flow rates in buildings including infiltration – (Module M5-5)
EN 15243	EN 16798-9	Energy performance of buildings – Ventilation for buildings - Part 9: Calculation methods for energy requirements of cooling systems (Modules M4-1, M4-4, M4-9) - General
N/A	CEN/TR 16798-10	Energy performance of buildings – Ventilation for buildings – Part 10: Interpretation of the requirements in EN 16798-9 — Calculation methods for energy requirements of cooling systems (Module M4-1, M4-4, M4-9) – General
EN 15243	EN 16798-13	Energy performance of buildings – Ventilation for buildings - Part 13: - Calculation of cooling systems (Module M4-8) – Generation
EN 15243	CEN/TR 16798-14	Energy performance of buildings – Ventilation for buildings - Part 14: Interpretation of the requirements in EN 16798-13 — Calculation of cooling systems (Module M4-8) – Generation
N/A	EN 16798-15	Energy performance of buildings – Ventilation for buildings – Part 15: Calculation of cooling systems (Module M4-7) – Storage
N/A	CEN/TR 16798-16	Energy performance of buildings – Ventilation for buildings – Part 16: Interpretation of the requirements in EN 16798-15 — Calculation of cooling systems (Module M4-7) – Storage

EN 15239 and EN 15240	EN 16798-17	Energy performance of buildings – Ventilation for buildings - Part 17: Guidelines for inspection of ventilation and air-conditioning systems (Module M4-11, M5-11, M6-11, M7-11)
N/A	CEN/TR 16798-18	Energy performance of buildings – Ventilation for buildings - Part 18: Interpretation of the requirements in EN 16798-17 — Guidelines for inspection of ventilation and air-conditioning systems (Module M4-11, M5-11, M6-11, M7-11)

The revision concerns mainly the following aspects:

- New structure to clarify designing and calculation aspects;
- Update of filtration aspects;
- Update of heat recovery aspects and leakages in these systems;
- Clear coordination with prEN 16798-1:2015, outdoor air volume flows have been shifted to prEN 16798-1:2015;
- All indoor air quality aspects have been deleted, supply air quality have been introduced;
- Aspects of energy performance have been updated;
- Update of definitions of systems;
- Update of SPF definitions and links to EU 327/2014 regulation;
- The document was split in a normative part, containing all the normative aspects and a supplementary technical report containing additional information and informative annexes;
- The standard allows a normative national annex;
- The standard was updated to cover hourly/monthly/seasonal time-step.

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.

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

The main target groups of this European 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. 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 European 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 European 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 16798-4).

This European Standard also provides requirements especially for designers, installers, manufacturers, building owners and users, on ventilation, air-conditioning and room-conditioning systems in order to achieve a comfortable and healthy indoor environment in all seasons with acceptable installation and running costs. This European Standard focuses on the system-aspects for typical applications and covers the following:

- Aspects important to achieve and maintain a good energy performance in the systems without any negative impact on the quality of the indoor environment.
- Definitions of design and performances data.

This document is a preview generated by EVS

## 1 Scope

This European Standard applies to the design, energy performance of buildings and implementation of ventilation, air conditioning and room conditioning systems for non-residential buildings subject to human occupancy, excluding applications like industrial processes. It focuses on the definitions of the various parameters that are relevant for such systems.

The guidance for design given in this European Standard and accompanying CEN/TR 16798-4 are mainly applicable to mechanical supply and/or exhaust ventilation systems. Natural ventilation systems or natural parts of hybrid ventilation systems are not covered by this European Standard. Reference is made to the Technical Report for informative guidance on the design of such systems.

Applications for residential ventilation are not dealt with in this European Standard. Performance of ventilation systems in residential buildings are dealt with in EN 15665 and CEN/TR 14788.

The classification uses different categories. For some values, examples are given and, for requirements, typical ranges with default values are presented. The default values given in this European Standard are not normative as such, and should be used where no other values are specified. Classification should always be appropriate to the type of building and its intended use, and the basis of the classification should be explained if the examples given in the European Standard are not to be used.

NOTE 1 Different standards may express the categories for the same parameters in a different way, and also the category symbols may be different.

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

NOTE 2 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 3 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 (in casu M5-1, M5-4), within the modular structure of the set of EPB standards**

Overarching		Building (as such)		Technical Building Systems										
	Descriptions		Descriptions		Descriptions	Heating	Cooling	Ventilation	Humidifi cation	Dehumidification	Domestic Hot water	Lighting	Building automation & control	PV, wind, ..
sub 1	M1	sub 1	M2	sub 1		M 3	M4	M5	M6	M 7	M 8	M9	M10	M11
1	General	1	General	1	General			EN 16798 -3						
2	Common terms and definitions; symbols, units and subscripts	2	Building Energy Needs	2	Needs									
3	Application s	3	(Free) Indoor Conditions without Systems	3	Maximu m Load and Power									
4	Ways to Express Energy Performan ce	4	Ways to Express Energy Performanc e	4	Ways to Express Energy Performa nce			EN 16798 -3						
5	Building Functions and Building Boundaries	5	Heat Transfer by Transmissi on	5	Emission & control									
6	Building Occupancy and Operating Conditions	6	Heat Transfer by Infiltration and Ventilation	6	Distributi on & control									
7	Aggregatio n of Energy Services and Energy Carriers	7	Internal Heat Gains	7	Storage & control									
8	Building Partitionin g	8	Solar Heat Gains	8	Generatio n & control									

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									
11	Inspection	11	Inspection	11	Inspection									
12	Ways to Express Indoor Comfort			12	BMS									
13	External Environment Conditions													
14	Economic Calculation													

NOTE The shaded modules are not applicable.

## 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.

Default references to EPB standards other than EN ISO 52000-1 are identified by the EPB module code number and given in Annex A (normative template) and Annex B (informative default choice).

NOTE Example of EPB module code number: M5-5, or M5-5.1 (if module M5-5 is subdivided), or M5-5/1 (if reference to a specific clause of the standard covering M5-5).

EN 308, Heat exchangers - Test procedures for establishing performance of air to air and flue gases heat recovery devices

EN 779, Particulate air filters for general ventilation — Determination of the filtration performance

EN 1822-3, High efficiency air filters (EPA, HEPA and ULPA) - Part 3: Testing flat sheet filter media

EN 1886, *Ventilation for buildings - Air handling units - Mechanical performance*

EN 12599:2012, *Ventilation for buildings - Test procedures and measurement methods to hand over air conditioning and ventilation systems*

EN 12792:2003, *Ventilation for buildings - Symbols, terminology and graphical symbols*

EN 13053:2006+A1:2011, *Ventilation for buildings - Air handling units - Rating and performance for units, components and sections*

EN 15780, *Ventilation for buildings - Ductwork - Cleanliness of ventilation systems*

prEN 16798-1:2015, *Energy performance of buildings — Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics — Module M1-6*

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

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 12792:2003, M1-6 and M1-9, EN ISO 7345:1995, EN ISO 52000-1, and the following apply.

The terms of EN ISO 52000-1 that are indispensable for the understanding of the underlying standard are repeated here.

#### 3.1 EPB standard

standard that complies with the requirements given in EN ISO 52000-1, CEN/TS 16628 and CEN/TS 16629

Note 1 to entry CEN/TS 16628 and CEN/TS 16629 contain specific rules to ensure overall consistency, unambiguity, transparency and flexibility, supported by common templates. EN ISO 52000-1, the overarching EPB standard, is indispensable for each EPB standard, because of the modular structure, common terms and definitions, symbols and subscripts and because it provides the general framework for the EPB assessment.

[SOURCE: EN ISO 52000-1]

#### 3.2 room conditioning system

combination of appliances designed to keep comfort conditions in a room within a defined range

Note 1 to entry: Air conditioning systems as well as surface based systems, such as embedded systems, chilled ceilings and chilled beams, are included.

#### 3.3 occupied zone

volume designed for human occupancy specified by horizontal and vertical planes

#### 3.4 ventilation effectiveness

performance of air diffusion system in removing the pollutants from the occupied zone of a room given by relation between the pollution concentrations in the supply air, the extract air and the indoor air in the breathing zone (within the occupied zone)

#### 3.5 specific fan power

amount of electric fan power divided by the air volume flow

#### 3.6 demand controlled ventilation

ventilation system where the ventilation rate is controlled by air quality, moisture, occupancy or some other indicator for the need of ventilation