



BSI Standards Publication

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)

National foreword

This Published Document is the UK implementation of CEN/TR 16798-6:2017.

The UK participation in its preparation was entrusted to Technical Committee RHE/2, Ventilation for buildings, heating and hot water services.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2017
Published by BSI Standards Limited 2017

ISBN 978 0 580 85872 7

ICS 91.140.30; 91.120.10

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 October 2017.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

TECHNICAL REPORT

CEN/TR 16798-6

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

June 2017

ICS 91.120.10; 91.140.30

English Version

**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, M6-5, M6-8, M7-5, M7-8)**

Performance énergétique des bâtiments - Ventilation des bâtiments - Partie 6 : Interprétation des exigences de l'EN 16798-5-1 et de l'EN 16798-5-2 - Méthodes de calcul des besoins énergétiques des systèmes de ventilation et de conditionnement d'air (Modules M5-6, M5-8, M6-5, M6-8, M7-5, M7-8)

Energieeffizienz von Gebäuden - Lüftung von Gebäuden - Teil 6: Interpretation der Anforderungen der EN 16798-5-1 und EN 16798-5-2 - Berechnungsmethoden für den Energiebedarf von Lüftungs- und Klimaanlageanlagen (Module M5-6, M5-8, M6-5, M6-8, M7-5, M7-8)

This Technical Report was approved by CEN on 27 February 2017. It has been drawn up by the Technical Committee CEN/TC 156.

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	9
3 Terms and definitions	9
4 Symbols, subscripts and abbreviations	9
4.1 Symbols.....	9
4.2 Subscripts.....	9
4.3 Abbreviations	10
5 Brief description of the methods and routing	10
5.1 Output of the methods.....	10
5.2 General description of the methods.....	10
5.2.1 Method 1.....	10
5.2.2 Method 2.....	11
5.3 Selection criteria between the methods.....	11
5.4 Application and implementation of the methods.....	12
5.4.1 Method 1.....	12
5.4.2 Method 2.....	13
6 Calculation method 1 (EN 16798-5-1)	13
6.1 Output data.....	13
6.2 Calculation time interval and calculation period.....	13
6.3 Input data.....	13
6.3.1 Source of data	13
6.3.2 Product data.....	14
6.3.3 System design data	14
6.3.4 Operating conditions	14
6.3.5 Constants and physical data	14
6.4 Calculation procedure, method 1.....	15
6.4.1 Applicable calculation interval	15
6.4.2 Distribution calculation.....	15
6.4.3 Generation calculation.....	18
7 Calculation method 2 (EN 16798-5-2)	35
7.1 Output data.....	35
7.2 Calculation interval.....	35
7.3 Input data.....	36
7.3.1 Source of data	36
7.3.2 Product data.....	36
7.3.3 System design data	36
7.3.4 Operating conditions	36
7.4 Calculation procedure	36
7.4.1 Applicable timestep.....	36
7.4.2 Operating conditions calculation	37
7.4.3 Energy calculation	39

8	Quality control	43
9	Compliance check	43
10	Worked out examples, method 1	43
10.1	Example 1	43
10.1.1	Description	43
10.1.2	Calculation details	47
10.1.3	Observations	47
11	Worked out examples, method 2	47
11.1	Description	48
11.2	Calculation details	52
11.3	Observations	52
12	Validation of the calculation procedures	52
Annex A	(informative) Input and method selection data sheet — Template	53
A.1	General	53
A.2	References	53
A.3	Product description data	53
A.4	Product technical data	53
A.5	System design data	53
Annex B	(informative) Input and method selection data sheet — Default choices	54
B.1	General	54
B.2	References	54
B.3	Product description data	54
B.4	Product technical data	54
B.5	System design data	55
Annex C	(informative) Calculation method for ground preheating and -cooling	56
Annex D	(informative) Calculation method for rotary heat exchangers	58
D.1	Calculation	58
D.2	Data	58
Annex E	(informative) Calculation examples	59
E.1	Spreadsheet	59
E.2	Example 1 (method 1)	59
E.3	Example 2 (method 2)	88
	Bibliography	118

European foreword

This document (CEN/TR 16798-6:2017) has been prepared by Technical Committee CEN/TC 156 “Ventilation for buildings”, the secretariat of which is held by BSI.

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.

The necessary editorial revisions were made to comply with the requirements for each CEN technical report.

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

For the convenience of Standards users CEN/TC 156, together with its possible 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, M6-5, 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)

Introduction

The set of EPB standards, Technical Reports and supporting tools

In order to facilitate the necessary overall consistency and coherence, in terminology, approach, input/output relations and formats, for the whole set of EPB-standards, the following documents and tools are available:

- a) a document with basic principles to be followed in drafting EPB-standards: CEN/TS 16628:2014, *Energy Performance of Buildings - Basic Principles for the set of EPB standards* [1];
- b) a document with detailed technical rules to be followed in drafting EPB standards; CEN/TS 16629:2014, *Energy Performance of Buildings - Detailed Technical Rules for the set of EPB-standards* [2]; and
- c) the detailed technical rules are the basis for the following tools:
 - 1) a common template for each EPB-standard, including specific drafting instructions for the relevant clauses,
 - 2) a common template for each technical report that accompanies an EPB standard or a cluster of EPB standards, including specific drafting instructions for the relevant clauses, and
 - 3) a common template for the spreadsheet that accompanies each EPB standard, to demonstrate the correctness of the EPB calculation procedures.

Each EPB standard follows the basic principles and the detailed technical rules and relates to the overarching EPB-standard, EN ISO 52000-1:2017 [3].

One of the main purposes of the revision of the EPB-standards is to enable that laws and regulations directly refer to the EPB-standards and make compliance with them compulsory. This requires that the set of EPB-standards consists of a systematic, clear, comprehensive and unambiguous set of energy performance procedures. The number of options provided is kept as low as possible, taking into account national and regional differences in climate, culture and building tradition, policy and legal frameworks (subsidiarity principle). For each option, an informative default option is provided (Annex B).

Rationale behind the EPB Technical Reports

There is a risk that the purpose and limitations of the EPB standards will be misunderstood, unless the background and context to their contents – and the thinking behind them – is explained in some detail to readers of the standards. Consequently, various types of informative contents are recorded and made available for users to properly understand, apply and nationally or regionally implement the EPB standards.

If this explanation would have been attempted in the standards themselves, the result is likely to be confusing and cumbersome, especially if the standards are implemented or referenced in national or regional building codes.

Therefore each EPB standard is accompanied by an informative technical report, like this one, where all informative content is collected, to ensure a clear separation between normative and informative contents (see CEN/TS 16629 [2]):

- to avoid flooding and confusing the actual normative part with informative content;
- to reduce the page count of the actual standard; and

- to facilitate understanding of the set of EPB standards.

This was also one of the main recommendations from the European CENSE project [5] that laid the foundation for the preparation of the set of EPB standards.

This Technical Report

This Technical Report accompanies the suite of EPB standards on the calculation of the energy performance of ventilation systems. It relates to the European standards EN 16798-5-1 and EN 16798-5-2, which form part of a set of standards related to the evaluation of the energy performance of buildings (EPB).

The role and the positioning of the accompanied standards in the set of EPB standards is defined in the Introduction to the standards.

Accompanying spreadsheet(s)

Concerning the accompanied standards EN 16798-5-1 and EN 16798-5-2, the following spreadsheets were produced:

- on EN 16798-5-1; and
- on EN 16798-5-2.

In this Technical Report, examples of each of these calculation sheets are included.

1 Scope

This Technical Report refers to standards EN 16798-5-1 and EN 16798-5-2.

It contains information to support the correct understanding and use of these standards.

This Technical Report does not contain any normative provision.

2 Normative references

Not applicable.

NOTE More information on the use of EPB module numbers for normative references between EPB standards is given in CEN ISO/TR 52000-2:2017.

3 Terms and definitions

For the purposes of this document, the terms and definitions as mentioned and given in the EN 16798-5-1 and EN 16798-5-2 apply.

More information on some key EPB terms and definitions is given in CEN ISO/TR 52000-2:2017.

4 Symbols, subscripts and abbreviations

4.1 Symbols

For the purposes of this document, the symbols as mentioned and given in EN 16798-5-1 and EN 16798-5-2 apply.

More information on key EPB symbols is given in CEN ISO/TR 52000-2:2017.

NOTE If new symbols are needed, indeed, please refer to the EPB standards template and Annex C of EN ISO 52000-1:2017 for detailed rules.

Additional symbols are given in Table 1.

Table 1 — Symbols and units

Symbol	Quantity	Unit
u	damper position	—
γ	concentration	various

4.2 Subscripts

For the purposes of this document, the subscripts as mentioned and given in EN 16798-5-1 and EN 16798-5-2 apply.

More information on key EPB subscripts is given in CEN ISO/TR 52000-2:2017.

NOTE If new subscripts are needed, indeed, please refer to the EPB standards template and Annex C of EN ISO 52000-1:2017 for detailed rules.

Additional subscripts are given in Table 2.