



BSI Standards Publication

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

National foreword

This Published Document is the UK implementation of CEN/TR 16798-16:2017.

BSI, as a member of CEN, is obliged to publish CEN/TR 16798-16:2017 as a Published Document. However, attention is drawn to the fact that during the development of this Published Document, the UK committee voted against its approval.

The technical reasoning behind the UK committee's response relates to the fact that it voted against the approval of EN 16798-15:2017 as a European Standard, to which this Technical Report relates.

Users may wish to consider these issues when specifying products.

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 2018
Published by BSI Standards Limited 2018

ISBN 978 0 580 85876 5

ICS 91.140.30; 91.120.10

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

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 November 2018.

Amendments/corrigenda issued since publication

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

TECHNICAL REPORT

CEN/TR 16798-16

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

June 2017

ICS 91.120.10; 91.140.30

English Version

**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**

Performance énergétique des bâtiments - Ventilation
des bâtiments - Partie 16 : Explication des exigences
de l'EN 16798-15 - Calcul des systèmes de
refroidissement (Module M4-7) - Stockage

Energieeffizienz von Gebäuden - Lüftung von
Gebäuden - Teil 16: Interpretation der Anforderungen
der EN 16798-15 - Berechnung von Kühlsystemen
(Modul M4-7) - Speicherung

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 and abbreviations	9
4.1 Symbols.....	9
4.2 Abbreviations.....	9
5 Brief description of the method.....	9
5.1 Output of the method.....	9
5.2 General description of the method.....	10
5.2.1 General.....	10
5.2.2 Assumptions.....	10
5.2.3 Number of volumes to model the storage	11
5.2.4 Calculation information.....	11
5.3 Flowchart of the calculation procedure.....	11
5.4 Technologies covered by the standard	11
5.5 Description of cooling systems.....	11
6 Calculation method.....	11
6.1 Output data.....	11
6.2 Calculation time interval and calculation period.....	11
6.3 Input data.....	12
6.3.1 Source of data	12
6.3.2 Product data.....	12
6.3.3 System design data	12
6.3.4 Operating conditions	13
6.3.5 Constants and physical data	13
6.3.6 Input data from Annex A (Annex B)	13
6.4 Calculation procedure hourly method	13
7 Quality control	13
8 Compliance check.....	13
9 Worked out examples.....	13
9.1 Storage model using water / ice	13
9.1.1 Description	13
9.1.2 Calculation details	13
9.2 Storage with PCM materials	13
9.2.1 Description	13
9.2.2 Calculation details	14
9.3 Remarks and comments	14
Annex A (informative) Input and method selection data sheet — Template	15
A.1 General.....	15
A.2 References	15
A.3 Hourly, monthly and annual method	15

A.4	Additional information for monthly method	15
Annex B	(informative) Input and method selection data sheet — Default choices	16
B.1	General	16
B.2	References	16
B.3	Hourly, bin, monthly and annual method	16
B.4	Additional information for monthly and annual method	16
Annex C	(informative) Calculation flowchart	17
Annex D	(informative) Calculation example	17
D.1	Spreadsheet	18
D.2	Example 1: water/ice as storage material	18
	Bibliography	27

Currently in preview, click buy full version

European foreword

This document (CEN/TR 16798-16:2017) 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 EPB Technical Report.

This document has been produced to meet the requirements of Directive 2010/31/EU of 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 Convenors, 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, *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, *Energy Performance of Buildings — Detailed Technical Rules for the set of EPB-standards* [2];
- 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;
 - 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 [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 EPB standard on the calculation of the energy performance of cooling storage systems. It relates to the standard EN 16798-15, which forms 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 standard EN 16798-15, the following spreadsheets were produced:

- on EN 16798-15 for ice storage type; and
- on EN 16798-15 for PCM storage type.

In this Technical Report, an example of one of these calculation sheets is included.

1 Scope

This Technical Report refers to the standard EN 16798-15.

It contains information to support the correct understanding, use and national adaptation of this standard.

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.

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

EN 12977-3, *Thermal solar systems and components - Custom built systems - Part 3: Performance test methods for solar water heater stores*

EN 15332, *Heating boilers - Energy assessment of hot water storage systems*

EN 16798-15, *Energy performance of buildings - Ventilation for buildings - Part 15: Calculation of cooling systems (Module M4-7) - Storage*

EN 60379, *Methods for measuring the performance of electric storage water-heaters for household purposes*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16798-15 apply.

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

4 Symbols and abbreviations

4.1 Symbols

For the purposes of this document, the symbols given in the accompanied EPB standard, EN 16798-15, apply.

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

4.2 Abbreviations

For the purposes of this document, the abbreviations given in the accompanied EPB standard, EN 16798-15, apply.

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

5 Brief description of the method

5.1 Output of the method

The method calculates the thermal balance of the storage unit which stored energy produced with an external refrigerating unit and delivers the energy stored alone or as a complement of the refrigerating unit to the cooling distribution system.