



# SLOVENSKI STANDARD

## SIST EN 16798-13:2018

01-julij-2018

Nadomešča:  
SIST EN 15243:2007

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**Energijske lastnosti stavb - Prezračevanje stavb - 13. del: Izračun za hladilne sisteme - Modul M4-8 - Proizvodnja**

Energy performance of buildings - Ventilation for buildings - Part 13: Calculation of cooling systems (Module M4-8) - Generation

Energetische Bewertung von Gebäuden - Lüftung von Gebäuden - Teil 13: Berechnung von Kühlsystemen (Modul M4-8) - Erzeugung

Performance énergétique des bâtiments - Partie 13: Module M4-8 - Calcul des systèmes de refroidissement - Génération

**Ta slovenski standard je istoveten z: EN 16798-13:2017**

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**ICS:**

|           |                                    |  |
|-----------|------------------------------------|--|
| 91.140.30 | Prezračevalni in klimatski sistemi | Ventilation and air-conditioning systems |
|-----------|------------------------------------|--|

**SIST EN 16798-13:2018**

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EUROPEAN STANDARD

EN 16798-13

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2017

ICS 91.120.10; 91.140.30

Supersedes EN 15243:2007

English Version

## Energy performance of buildings - Part 13: Module M4-8 - Calculation of cooling systems - Generation

Performance énergétique des bâtiments - Partie 13:  
Module M4-8 - Calcul des systèmes de refroidissement  
- Génération

Energieeffizienz von Gebäuden - Teil 13: M4-8 Modul -  
Berechnung der Kühlsysteme - Erzeugung

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

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## Contents

|   | Page      |
|---|-----------|
| European foreword.....                          | 4         |
| Introduction .....                              | 7         |
| <b>1 Scope.....</b>                             | <b>9</b>  |
| <b>2 Normative references.....</b>              | <b>11</b> |
| <b>3 Terms and definitions .....</b>            | <b>11</b> |
| <b>4 Symbols and subscripts .....</b>           | <b>11</b> |
| 4.1 Symbols.....                                | 11        |
| 4.2 Subscripts.....                             | 12        |
| <b>5 Brief description of the methods.....</b>  | <b>12</b> |
| 5.1 Output of the method.....                   | 12        |
| 5.2 General description of the methods .....    | 14        |
| 5.3 Selection criteria between the methods..... | 14        |
| <b>6 Calculation method, method 1.....</b>      | <b>14</b> |
| 6.1 Output data.....                            | 14        |
| 6.2 Calculation intervals.....                  | 16        |
| 6.3 Input data.....                             | 16        |
| 6.3.1 Source of data, general.....              | 16        |
| 6.3.2 Product data.....                         | 16        |
| 6.3.3 Configuration and system design data..... | 20        |
| 6.3.4 Operating conditions .....                | 21        |
| 6.3.5 Constants and physical data.....          | 22        |
| 6.3.6 Input data from Annex A (Annex B) .....   | 22        |
| 6.4 Calculation procedure, method 1 .....       | 22        |
| 6.4.1 Applicable time intervals .....           | 22        |
| 6.4.2 Operating conditions calculation .....    | 22        |
| 6.4.3 Calculation.....                          | 27        |
| <b>7 Calculation method, method 2.....</b>      | <b>30</b> |
| 7.1 Output data.....                            | 30        |
| 7.2 Calculation intervals .....                 | 31        |
| 7.3 Input data.....                             | 32        |
| 7.3.1 Product data.....                         | 32        |
| 7.3.2 System design data .....                  | 35        |
| 7.3.3 Operating conditions .....                | 36        |
| 7.4 Calculation procedure, method 2 .....       | 36        |
| 7.4.1 Applicable time interval .....            | 36        |
| 7.4.2 Operating conditions calculation .....    | 36        |
| 7.4.3 Calculation.....                          | 42        |
| <b>8 Quality control .....</b>                  | <b>44</b> |
| <b>9 Compliance check.....</b>                  | <b>44</b> |

|  |           |
|--|-----------|
| <b>Annex A (normative) Input and method selection data sheet — Template .....</b>          | <b>45</b> |
| <b>A.1 General .....</b>   | <b>45</b> |
| <b>A.2 References.....</b>   | <b>46</b> |
| <b>A.3 Input data method 1 .....</b>   | <b>46</b> |
| <b>A.3.1 Product description data .....</b>  | <b>46</b> |
| <b>A.3.2 Product technical data tables.....</b>  | <b>46</b> |
| <b>A.3.3 System design data.....</b>   | <b>47</b> |
| <b>A.4 Input data method 2 .....</b>   | <b>48</b> |
| <b>A.4.1 Product description data .....</b>  | <b>48</b> |
| <b>A.4.2 Product technical data.....</b>   | <b>48</b> |
| <b>A.4.3 System design data.....</b>   | <b>48</b> |
| <b>Annex B (informative) Input and method selection data sheet — Default choices .....</b> | <b>55</b> |
| <b>B.1 General .....</b>   | <b>55</b> |
| <b>B.2 References.....</b>   | <b>56</b> |
| <b>B.3 Input data method 1 .....</b>   | <b>56</b> |
| <b>B.3.1 Product description data .....</b>  | <b>56</b> |
| <b>B.3.2 Product technical data tables.....</b>  | <b>56</b> |
| <b>B.3.3 System design data.....</b>   | <b>57</b> |
| <b>B.4 Input data method 2 .....</b>   | <b>58</b> |
| <b>B.4.1 Product description data .....</b>  | <b>58</b> |
| <b>B.4.2 Product technical data.....</b>   | <b>58</b> |
| <b>B.4.3 System design data.....</b>   | <b>59</b> |
| <b>Bibliography .....</b>  | <b>67</b> |

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**EN 16798-13:2017 (E)****European foreword**

This document (EN 16798-13:2017) 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 December 2017 and conflicting national standards shall be withdrawn at the latest by December 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, together with parts 9 and 11 of the series, supersedes EN 15243:2007, 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.

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".

For the convenience of Standards users (standards.iteh.ai) 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". <https://standards.iteh.ai/catalog/standards/sist/d32bd66f-1b66-47db-ac97-ded6fe8501cd/sist-en-16798-13-2018>

| 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 16798-13:2017 (E)

|                       |                 |  |
|-----------------------|-----------------|--|
| 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) |

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.

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## Introduction

This 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 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 standard are all the users of the set of EPB standards (e.g. engineers, regulators and programmers).

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 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 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 16798-14 [2], under preparation).

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

**EN 16798-13:2017 (E)**

TC 156 deals with ventilation and air conditioning systems in buildings. Subjects covered by TC 156 are:

- cooling load calculation;
- energy performance calculation for ventilation, air conditioning, and cooling systems;
- inspection of ventilation and air conditioning systems; and
- installation and commissioning of ventilation and air conditioning systems.

This standard specifies a method to calculate the cooling generation of compression, absorption and other types of refrigeration systems. This standard extends EN 15243:2007, which was developed during the first EPBD mandate.

The extension for inclusion in the second mandate package was performed by CEN/TC 156 WG 21.

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## 1 Scope

This European Standard covers the calculation of the operational parameters and the energy consumption of cooling generation systems. The cooling generation consists of:

- cooling generators like compression and absorption chillers;
- other (generic) generator types such as ground or surface water or direct use of ground heat from boreholes; and
- different types of heat rejection (dry, wet, hybrid with outdoor air, other sink types).

The methods cover:

- the possibility of heat recovery of heat to be rejected for the use of heating and/or domestic hot water production, through the use of an interface to the M3-1 standard; and
- a multi generator calculation.

The document does not cover the cooling emission, distribution and storage systems, which are covered by the Module M4-5, M4-6 and M4-7 standards, respectively. It is directly connected to the general part of the cooling systems, the M4-1 standard.

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 52000-1:2017.

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 might cover more than one module and one module might 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.

## EN 16798-13:2017 (E)

Table 1 — Position of this standard (in casu M4–8) within the modular structure of the set of EPB standards

| Submodule | Overarching   | Building (as such)                            | Technical Building Systems                |         |             |             |                |                  |                    |          |                                 |              |
|-----------|---|---|---|---------|-------------|-------------|----------------|------------------|--------------------|----------|---------------------------------|--------------|
|           | Descriptions  | Descriptions                                  | Descriptions                              | Heating | Cooling     | Ventilation | Humidification | Dehumidification | Domestic Hot water | Lighting | Building automation and control | PV, wind, .. |
| sub1      | M1  | M2  |   | M3      | M4          | M5          | M6             | M7               | M8                 | M9       | M10                             | M11          |
| 1         | General   | General                                       | General                                   |         |             |             |                |                  |                    |          |                                 |              |
| 2         | Common terms and definitions; symbols, units and subscripts | Building Energy Needs                         | Needs                                     |         |             |             |                |                  |                    |          | a                               |              |
| 3         | Applications  | (Free) Indoor Conditions without Systems      | Maximum Load and Power                    |         |             |             |                |                  |                    |          |                                 |              |
| 4         | Ways to Express Energy Performance                          | Ways to Express Energy Performance            | Ways to Express Energy Performance        |         |             |             |                |                  |                    |          |                                 |              |
| 5         | Building categories and Building Boundaries                 | Heat Transfer by Transmission                 | Emission and control                      |         |             |             |                |                  |                    |          |                                 |              |
| 6         | Building Occupancy and Operating Conditions                 | Heat Transfer by Infiltration and Ventilation | Distribution and control                  |         |             |             |                |                  |                    |          |                                 |              |
| 7         | Aggregation of Energy Services and Energy Carriers          | Internal Heat Gains                           | Storage and control                       |         |             |             |                |                  |                    |          |                                 |              |
| 8         | Building zoning   | Solar Heat Gains                              | Generation and control                    |         | EN 16798-13 |             |                |                  |                    |          |                                 |              |
| 9         | Calculated Energy Performance                               | Building Dynamics (thermal mass)              | Load dispatching and operating conditions |         |             |             |                |                  |                    |          |                                 |              |
| 10        | Measured Energy Performance                                 | Measured Energy Performance                   | Measured Energy Performance               |         |             |             |                |                  |                    |          |                                 |              |
| 11        | Inspection  | Inspection                                    | Inspection                                |         |             |             |                |                  |                    |          |                                 |              |
| 12        | Ways to Express Indoor Comfort                              |   | BMS                                       |         |             |             |                |                  |                    |          |                                 |              |
| 13        | External Environment Conditions                             |   |   |         |             |             |                |                  |                    |          |                                 |              |
| 14        | Economic Calculation  |   |   |         |             |             |                |                  |                    |          |                                 |              |

<sup>a</sup> 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.

EN ISO 52000-1:2017, *Energy performance of buildings — Overarching EPB assessment — Part 1: General framework and procedures*

EN 14511 (series), *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling*

EN 14825, *Air conditioners, liquid chilling packages and heat pumps, with electrically driven compressors, for space heating and cooling - Testing and rating at part load conditions and calculation of seasonal performance*

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

ISO 7345:1995, *Thermal insulation – Physical quantities and definitions*

NOTE 1 Default references to EPB standards other than EN ISO 52000-1:2017 are identified by the EPB module code number and given in Annex A (normative template) and Annex B (informative default choice).

NOTE 2 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).

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7345:1995 and EN ISO 52000-1:2017 apply.

NOTE The terms of EN ISO 52000-1:2017 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 52000-1:2017, 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 52000-1:2017, 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 52000-1:2017]

## 4 Symbols and subscripts

### 4.1 Symbols

For the purposes of this document, the symbols given in Clause 4 and Annex C of EN ISO 52000-1:2017 and the specific symbols listed in Table 2 apply.

Table 2 — Symbols and units

| Symbol     | Quantity                | Unit  |
|------------|-------------------------|-------|
| <i>EER</i> | energy efficiency ratio | —     |
| <i>f</i>   | part-load factor        | -; %  |
| <i>k</i>   | part-load stage         | -; %  |
| <i>p</i>   | specific power          | kW/kW |
| $\zeta$    | heat ratio              | —     |

## 4.2 Subscripts

For the purposes of this document, the subscripts given in Clause 4 and Annex C of EN ISO 52000-1:2017, EN 12792:2003 and the specific subscripts listed in Table 3 apply.

Table 3 — Subscripts

| Subscript | Term                      |
|-----------|---------------------------|
| cvd       | covered                   |
| evap      | evaporative               |
| hr        | heat rejection system     |
| n         | nominal                   |
| op<br>PL  | in operation<br>part-load |
| rej       | rejected                  |
| wb        | wet-bulb                  |

## 5 Brief description of the methods

### 5.1 Output of the method

The methods cover the calculation of:

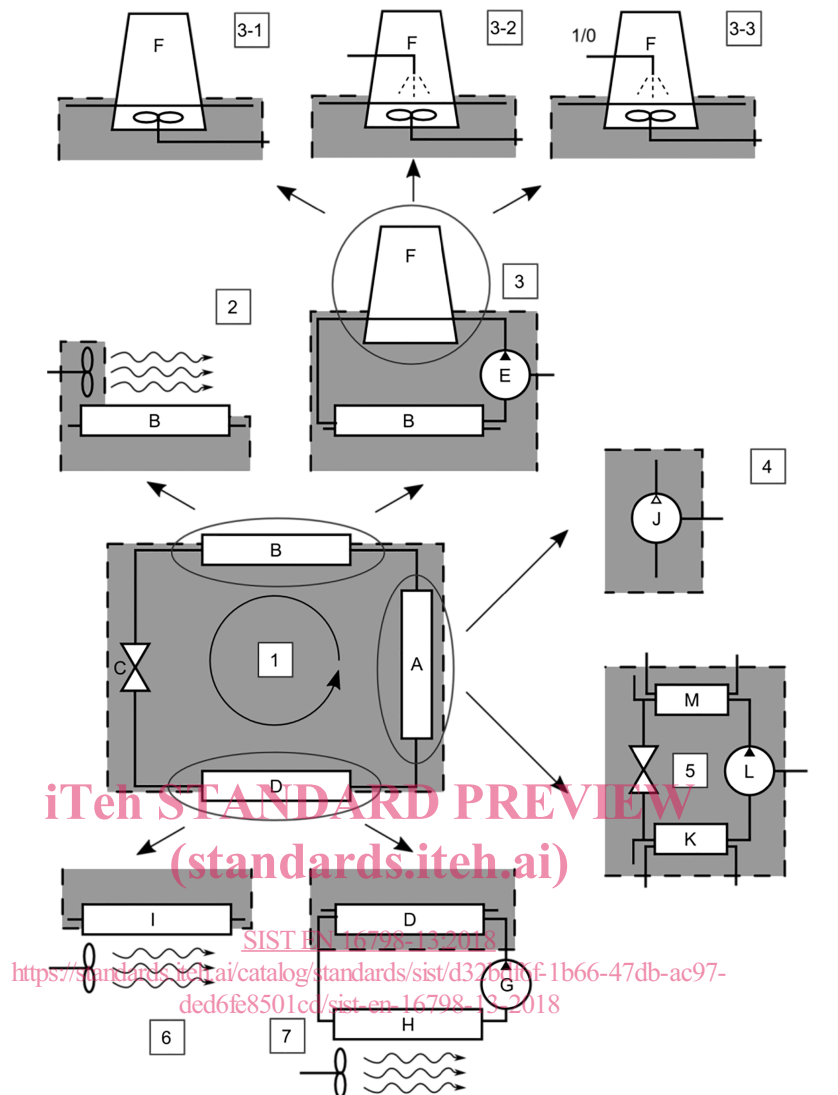
- the electrical energy (in case of compression type systems) and the heat (in case of absorption type systems) consumption for a requested cooling energy;
- the thermal energy being available for heat recovery; and
- the auxiliary energy consumption for cooling generation (e.g. power of heat rejection system (distribution and ventilation), control, sensors and actors).

The time interval of the output can be:

- annual;
- monthly; or
- hourly,

in accordance with the application of this standard.

The system design options covered within this standard are illustrated in Figure 1.

**Key**

|   |                                       |     |                                     |
|---|---------------------------------------|-----|-------------------------------------|
| A | driving component                     | M   | desorber                            |
| B | condenser                             | 1   | basic thermodynamic circuit         |
| C | expansion valve                       | 2   | air-cooled condenser                |
| D | evaporator                            | 3   | water-cooled condenser              |
| E | cooling water pump                    | 3-1 | dry heat rejection                  |
| F | cooling tower                         | 3-2 | wet heat rejection                  |
| G | chilled water pump                    | 3-3 | hybrid heat rejection               |
| H | cooling emission (from chilled water) | 4   | compression type system             |
| I | cooling emission (from refrigerant)   | 5   | absorption type system              |
| J | compressor                            | 6   | direct evaporation                  |
| K | absorber                              | 7   | indirect evaporation (i.e. chiller) |
| L | solvent pump                          |     |                                     |

**Figure 1 — System design options covered within this standard**