
Energetska učinkovitost stavb – Modula M5-6 in M5-8 - Prezračevanje stavb - Računske metode za energetske zahteve prezračevalnih sistemov - 5-2. del: Distribucija in proizvodnja (revizija EN 15241) - Metoda 2

Energy performance of buildings - Modules M5-6, M5-8 - Ventilation for buildings - Calculation methods for energy requirements of ventilation systems - Part 5-2: Distribution and generation (revision of EN 15241) - method 2

Energieeffizienz von Gebäuden - Module M5-6, M5-8 - Lüftung von Gebäuden - Berechnungsmethoden für den Energiebedarf von Lüftungs- und Klimaanlageanlagen - Teil 5-2: Verteilung und Erzeugung (Revision von EN 15241) - Methode 2

Performance énergétique des bâtiments - Modules M5-6, M5-8 - Ventilation des bâtiments - Méthodes de calcul pour les besoins énergétiques des systèmes de ventilation - Partie 5-2 : Distribution et génération (révision de l'EN 15241) - Méthode 2

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15241) - Méthode 2

Energieeffizienz von Gebäuden - Module M5-6, M5-8 -
Lüftung von Gebäuden - Berechnungsmethoden für den
Energiebedarf von Lüftungs- und Klimaanlage - Teil 5-2:
Verteilung und Erzeugung (Revision von EN 15241) -
Methode 2

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 156.

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Foreword

This document (prEN 16798-5-2:2015) has been prepared by Technical Committee CEN/TC 156 “Ventilation for buildings”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 15241:2007.

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Introduction

This standard is part of a set of standards developed to support EPBD directive implementation, hereafter called "EPB standards".

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

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

- 1) energy performance calculation for ventilation, air conditioning and cooling systems;
- 2) inspection of ventilation and air conditioning systems;

This standard replaces EN 15241, which was developed during the first EPBD mandate and was published in 2007.

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

The revision includes the splitting of former EN 15241:2007 into 2 separate parts.

- prEN 16798-5-1 (covering full air conditioning systems)
- prEN 16798-5-2 (covering ventilation systems which intended for residential buildings)

The revision of this standard prEN 16798-5-2 includes changes:

- for a rearrangement of content versus EN 15242:2007, in order to better fit in the modular structure given in EN 15603
- to cover ventilation systems which intended for residential buildings (including air heating and air cooling definition see EN 13779 rev, module M5-1)
- for an improved fan energy calculation, taking into consideration control strategies according to TC 247 and fan product standards /data
- for an improved calculation of heat recovery devices, delivering the efficiency and auxiliary energy depending on control
- the formatting according to the new rules set in CEN/TS 16629 Detailed Technical Rules
- the consideration of ISO TC 205 work performed in the meantime.

The standard was updated to cover especially monthly or seasonal time-step.

1 Scope

Table 1 shows the relative position of this standard within the EN EPB set of standards.

Table 1 — Position of this standard in the modular structure

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

This standard covers energy performance calculation of mechanical ventilation systems. It takes into account the generation (air handling unit) and distribution (duct system) parts. It does not cover the emission part (calculation of the required volume flow rates and/or supply air conditions), which is covered in prEN 16798-7 (revised EN 15242).

A calculation method for air conditioning systems, using an hourly calculation time step, is provided in a separate standard prEN 16798-5-1.

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 1507:2006, *Ventilation for buildings - Sheet metal air ducts with rectangular section - Requirements for strength and leakage*

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

EN 12237:2003, *Ventilation for buildings - Ductwork - Strength and leakage of circular sheet metal ducts*

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

EN 13141 (all parts), *Ventilation for buildings - Performance testing of components/products for residential ventilation*

EN 14239, *Ventilation for buildings - Ductwork - Measurement of ductwork surface area*

EN 16147:2011, *Heat pumps with electrically driven compressors - Testing and requirements for marking of domestic hot water units*

prEN 16798-3:2014, *Energy performance of buildings - Part 3: Ventilation for non-residential buildings - Performance requirements for ventilation and room-conditioning systems (revision of EN 13779)*

prEN 16573:2013, *Energy performance of buildings — Modules M5-6, M5-8 — Ventilation for buildings — Calculation methods for energy requirements of ventilation systems — Part 5-2: Distribution and generation (revision of EN 15241) — method 2*

prEN 15603:2014, *Energy performance of buildings — Overarching standard EPB*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 7345:1995, prEN 15603:2014, EN 12792:2003, prEN 16798-3:2014, and the following specific definitions apply.

3.1.1

cooled area

space that is cooled to a defined set-point temperature

3.1.2

duct heat losses

heat losses (by leakage and heat transfer) of the ductwork

3.1.3

duct leakage volume flow extracted from the ventilation zone

leakage air to the extract air ducts extracted from the ventilation zone

3.1.4

duct leakage volume flow going to the ventilation zone

leakage air from the supply air ducts going to the ventilation zone

3.1.5

extract volume flow from the ventilation zone

extract air flow rate extracted from the ventilation zone

3.1.6**heat losses of the AHU**

heat losses (by leakage and heat transfer) of the air handling unit

3.1.7**heat transferred by preheating/precooling**

heat transferred to the outside air by preheating and precooling

3.1.8**heat transferred by recirculation**

heat transferred to the outside air by recirculation of extract air

3.1.9**heat transferred by heat recovery**

heat transferred to the outside air by heat recovery from extract air

3.1.10**recoverable AHU heat Losses**

heat losses (by leakage and heat transfer) of the air handling unit, recoverable for heating and cooling (negative values)

3.1.11**recoverable duct heat losses**

heat losses (by leakage and heat transfer) of the ductwork, recoverable for heating and cooling (negative values)

3.1.12**required AHU heating coil input**

heat required to be supplied to the air handling unit for heating the supply air to the setpoint

3.1.13**required heating coil water inlet temperature**

heating coil water inlet temperature required to heat the supply air to the setpoint

3.1.14**supply outside air fraction**

fraction of outside air in the supply air

3.1.15**supply volume flow rate going to ventilation zone**

supply air flow rate going to the ventilation zone

3.1.16**ventilated area**

space which is provided with ventilation

3.1.17**ventilation auxiliary energy**

auxiliary energy for the service of ventilation (for heat recovery drives, electrical preheating and for control)

4 Symbols and abbreviations

4.1 Symbols

For the purposes of this document, the symbols given in prEN 15603:2014, EN 12792:2003 and the specific symbols listed in Table 2 apply.

Table 2 — Symbols and units

Symbol	Quantity	Unit
F	degree-hour value for preheating the air	Kh
H	surface coefficient of heat transfer	W/(m ² ·K)
R	evaporation heat of the water	kWh/kg
X	moisture content	kg/kg _{dry air}
V	velocity	m/s

4.2 Subscripts

For the purposes of this document, the subscripts given in prEN 15603:2014, and the specific subscripts listed in Table 3 apply.

Table 3 — Subscripts

Subscript	Term	Subscript	Term
amb	ambient	lea	leakage
cas	casing	nc	non-conditioned
cnd	conditioned	nom	nominal
damp	water damp	out	output generation
des	design	prec	precooling
dhh	degree hour for preheating	preh	preheating
du	duct	rca	recirculation
e	external	rh	reheating
hp	heat pump	req	required
hr	heat recovery	sur	surrounding
in	output generation	xr	humidity recovery

4.3 Abbreviations

For the purposes of this document, the abbreviations given in prEN 15603:2014, and the specific subscripts listed in Table 4 apply.

Table 4 — Abbreviations

Abbreviation	Term
EHA	Exhaust air
ETA	Extract air
IDA	Indoor air
ODA	Outdoor air
RCA	Recirculation air
SUP	Supply air

5 Description of the method

5.1 Output of the method

The method covers the calculation of

- The volume flow rates provided to a single ventilation zone (no multi ventilation zones modelling) served by the system, based on the required values;
- The supply air temperature and moisture content, based on the required values;
- The ventilation generation input (electric energy required by fans);
- Heating and cooling input to the air handling unit (to be transferred to the connected heating and cooling distribution systems calculation);
- The recoverable heat or cold losses from ventilation/air conditioning system for heating or cooling.
- The ventilation auxiliary energy (electric energy for drives, control devices, actuators, ...).

The time step of the output can be:

- a. monthly
- b. yearly

according to the application of the standard and time-step of the input.

5.2 Optional method

An alternative calculation method for air conditioning systems, using an hourly calculation time step, is provided in a separate standard prEN 16798-5-1.

6 Method

6.1 Output data

The output data of this method are listed in Table 5.

Table 5 — Output data of this method

Name	Symbol	Unit	Range	Intended destination	Varying
Electrical input of heat pump for domestic hot water	$Q_{W;V;hp;in}$	kWh	0...∞	M1–9	Yes
Electrical input of heat pump for space heating	$Q_{H;V;hp;in}$	kWh	0...∞	M1–9	Yes
Electrical input of heat pump for cooling	$Q_{C;V;hp;in}$	kWh	0...∞	M1–9	Yes
Ventilation fan energy	$E_{V;gen;fan}$	kWh	0...∞	M1–9, M5–4	Yes
Ventilation auxiliary energy	$W_{V;aux}$	kWh	0...∞	M1–9, M5–4	Yes
Recoverable duct heat losses	$Q_{Is;V;dis;rbt}$	kWh	0...∞	M2–2	Yes
Recoverable AHU heat losses	$Q_{Is;V;gen;rbt}$	kWh	0...∞	M2–2	Yes
Required heating coil input	$Q_{H;V;in;req}$	kWh	0...∞	M3–1	Yes
Energy output of heat pump to domestic hot water system	$Q_{W;V;hp;out}$	kWh	0...∞	M3–1	Yes
Energy output of heat pump to the cooling system	$Q_{C;V;hp;out}$	kWh	0...∞	M4–1	Yes
Duct heat losses	$Q_{Is;V;dis}$	kWh	0...∞	M5–4	Yes
AHU heat losses	$Q_{Is;V;gen}$	kWh	0...∞	M5–4	Yes
Heat transferred by heat recovery	Q_{hr}	kWh	–∞...∞	M5–4	Yes
Mean supply volume flow going to zone	$q_{V;SUP;dis}$	m ³ /h	0...∞	M5–5	Yes
Mean extract volume flow from the zone	$q_{V;ETA;dis}$	m ³ /h	0...∞	M5–5	Yes
Mean duct leakage supply volume flow going to zone	$q_{V;lea;SUP;dis}$	m ³ /h	0...∞	M5–5	Yes
Mean duct leakage extract volume flow from the zone	$q_{V;lea;ETA;dis}$	m ³ /h	0...∞	M5–5	Yes
Supply air temperature	$\vartheta_{SUP;dis;out;k}$	°C	–273...∞	M5–5	Yes
Supply air moisture content	$x_{SUP;dis;out;k}$	kg/kg dry air	0...∞	M5–5	Yes
Energy output of heat pump to the space heating system	$Q_{H;V;hp;out}$	kWh	0...∞	M8–1	Yes