
Oprema za komercialne kuhinje - Sestavni deli za prezračevanje v komercialnih kuhinjah - 1. del: Splošne zahteve, vključno z računskimi metodami

Equipment for commercial kitchens - Components for ventilation of commercial kitchens - Part 1: General requirements including calculation method

Großküchengeräte - Einrichtungen zur Be- und Entlüftung von gewerblichen Küchen - Teil 1: Allgemeine Anforderungen einschließlich Berechnungsmethoden

Équipement pour cuisines professionnelles - Éléments de ventilation pour cuisines professionnelles - Partie 1: Exigences générales et méthode de calcul

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**Equipment for commercial kitchens - Components for ventilation
of commercial kitchens - Part 1: General requirements including
calculation method**

Équipement pour cuisines professionnelles - Éléments de
ventilation pour cuisines professionnelles - Partie 1:
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von gewerblichen Küchen - Teil 1: Allgemeine
Anforderungen einschließlich Berechnungsmethoden

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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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (prEN 16282-1:2014) 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.

The activities of CEN/TC 156/WG 14, cover the calculation of the air volume and the design and testing of major components of ventilation equipment for commercial kitchens.

The structure of the standard series is as follows:

prEN 16282 *Equipment for commercial kitchens – Components for ventilation in commercial kitchens*

- *Part 1: General requirements including calculation method*
- *Part 2: Kitchen ventilation hoods; Design and safety requirements*
- *Part 3: Kitchen ventilation ceilings; Design and safety requirements*
- *Part 4: Air inlets and outlets; Design and safety requirements*
- *Part 5: Air duct; Design and dimensioning*
- *Part 6: Aerosol separators; Design and safety requirements*
- *Part 7: Installation and use of fixed fire suppression systems*
- *Part 8: Installations for treatment of cooking fumes; Requirements and testing*
- *Part 9: Capture and containment performance of extraction systems – test methods*

1 Scope

This European Standard specifies general requirements, such as ergonomic aspects in relation to ventilation of the kitchen (temperature, air aspects, moisture, noise, etc.), including a method for calculating the airflows.

This European Standard is applicable to ventilation systems in commercial kitchens, associated areas and other installations processing foodstuffs intended for commercial use. Kitchens and associated areas are special rooms in which meals are prepared, where tableware and equipment is washed, cleaned and food is stored.

This European Standard is not applicable to kitchen ventilation systems that are used in domestic kitchens.

Unless otherwise specified, the requirements of this standard shall be checked by way of inspection and/or measurement.

NOTE Please note the possible existence of additional or alternative national regulations on installation, appliance requirements and inspection, maintenance, operation.

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.

prEN 16282-5, *Equipment for commercial kitchens – Components for ventilation in commercial kitchens – Part 5: Air duct; Design and dimensioning*

prEN 16282-9, *Equipment for commercial kitchens – Components for ventilation in commercial kitchens – Part 9 – Capture and containment performance of extraction systems for commercial kitchen – test methods*

EN ISO 7730, *Ergonomics of the thermal environment - Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria (ISO 7730:2005)*

EN 12792, *Ventilation for buildings – Symbols, terminology and graphical symbols*

EN 13779, *Ventilation for non-residential buildings – Performance requirements for ventilation and room-conditioning systems*

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

EN 13053, *Ventilation for buildings - Air handling units - Rating and performance for units, components and sections*

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

3 Terms, definitions, symbols and abbreviated terms

For the purposes of this document, the terms, definitions, symbols and abbreviated terms given in EN 12792 and the following apply.

3.1

capture velocity

airflow velocity in the free space between the lower part of the hood and the cooking appliance

3.2**direct heat**

$\dot{Q}_s$ Heat which results in an increase in temperature and is therefore measurable

3.3**latent heat**

$\dot{Q}_t$ Heat released or absorbed by the equipment

Symbols		Unit
a	allowance factor	-
ACH	air changes per hour	in 1/h
AHU	air handling unit	-
ATD	air terminal device	-
B	breadth	in m
b	degree of pollution	-
D	moisture emission	in g/(h kW)
d_{hydr}	hydraulic diameter	in m
e_{eff}	capture and containment efficiency	in %
H	height above the floor	in m
h	appliance height	in m
i	number of the cooking group	-
j	number of the appliance in the same cooking group	-
k	convective	-
k	empirically determined coefficient	in $m^{4/3} W^{-1/3} h^{-1}$
L	length	in m
m	total number of appliances in the same cooking group	-
$\dot{m}_d$	mass flow	in kg/h
n	total number of cooking groups	-
P	power consumption	in W
ρ	density	in kg/m ³
$\dot{Q}_{s,K}$	convectively transmitted proportion of the direct heat load	in W
$\dot{Q}_s$	direct heat	in W
$\dot{Q}_t$	latent heat	in W
q_{v-ext}	total hood extract volume	in m ³ /h
r	reduction factor for thermal flow	-
U	unobstructed perimeter of the hood	in m
$\dot{V}_{th}$	thermic flow	in m ³ /h
$\dot{V}$	volumetric airflow	in m ³ /h

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$\dot{V}_{ABL}$	exhaust airflows	in m ³ /h
$\dot{V}_{Ausgl}$	compensation airflow	in m ³ /h
$\dot{V}_{Erf}$	extraction airflows for extraction hoods	in m ³ /h
$\dot{V}_{th,ne}$	total airflow	in m ³ /h
$\Delta\dot{V}$	difference in air volume flows	in m ³ /h
v	capture air velocity	in m/s
x_{EX}	absolute water content of air, exhaust air	in kg/kg _{dry air}
x_{SUP}	absolute water content of air, supply air	in kg/kg _{dry air}
z	height above the heat source	in m
φ	diversity factor	-

4 Objectives of kitchen ventilation

Supply and exhaust air systems shall be installed in kitchen areas in such a way that they ensure that odours, air pollutants and moisture are drawn off. The air in rooms not forming part of the kitchen area shall not be impaired and no air which could be considered unhygienic shall be supplied to these rooms and it shall not be possible for such air to flow back into these rooms.

The ventilation system shall be capable of separating odours, particles of fat and gaseous products from the exhaust air.

Note Ventilation and supply air systems are necessary in commercial kitchens because:

- the air is polluted by odours, particles of fat and gaseous products of combustion and other particulates, this pollution needs to be removed;
- indoor air quality needs to be suitable for peoples' health, hygiene and comfort;
- heat is created to a considerable extent due to convection and radiant heat and this heat needs to be kept at an acceptable level;
- moisture is created by various kitchen processes and this moisture needs to be kept at an acceptable level;
- it is necessary to renew the air in the rooms by an exchange with outside air and maintain comfortable or specified room air conditions.

5 Classification of kitchens

Kitchens are classified according to the following features:

- spatial arrangement of appliances;
- types of meal preparation;
- number of portions to be prepared within the time limit;
- variety of meals to be prepared;
- work sequence;
- assignment of individual rooms within kitchen area and the kitchen area itself to the meal dispatch point

The kitchen shall be classified in accordance with Table A.2 in normative Annex A.

The following are possible ways of connecting the kitchen to the meal dispatch point:

- kitchens with a directly-connected meal dispatch point to the dining room;
- kitchens with a separately-arranged meal dispatch point or with a distribution kitchen;
- kitchens within dining areas without a spatial separation, e.g. snack bars etc.

There are zones within kitchens which can be subject to special hygiene needs. These are for example.

- cold areas;
- hot areas;
- meat preparation areas;
- fish preparation areas;
- meal dispatched areas.

6 Design principles

6.1 General requirements

Kitchens with kitchen equipment of a nominal power supply exceeding 25 KW shall have exhaust and supply air. All other kitchens shall have at least an exhaust air system.

NOTE 1 Please note the possible existence of National regulations regarding exhaust and supply air to kitchens.

NOTE 2 Typical kitchen equipment emitting critical air pollution

- Dish Washer
- Microwave Oven / Toaster
- Bains Marie/ Hot Cupboard
- Induction Hob/Ceramic Stove
- Pastry/Bakery Oven
- Boiling Pan
- Cooker
- Oven
- Boiling Pan/Tilting Kettle
- Bratt Pan/Tilting Skillet
- Open Top Range and Oven

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- Griddle
- Fryer
- Rotisserie
- Chain Broiler (Burger Conveyor)
- Salamander/Steak Grille
- Chargrille/Charbroiler
- Wok Range

The following data and facts shall be available for the design and operation of ventilation and supply air systems for kitchens:

- type of kitchen;
- number of portions to be prepared per time unit;
- operating time;
- room geometry;
- physical data for the individual building components;
- type and intensity of lighting.

Details of the following shall also be available:

- type of appliances and connected loads;
- installation and dimensions of appliances;
- duty times;
- similarity of appliance utilization.

NOTE 3 To minimize the necessary airflows, it is useful to install heat-emitting appliances in continuous groups or along surfaces forming room boundaries.

If the exhaust air comes into direct contact with the structure of the building, to the ventilation system shall be suitable to ensure that this does not damage the building structure and that no persistent condensation occurs.

6.2 Heat and pollutant loads

Pollution loads can vary within the kitchen's radiant heat.

Radiant heat intensive areas are characterized by high surface temperatures of cooking appliances Radiant heat. The direct and latent heat relative to the connected load of the appliances, as well as the emission of steam are given for individual appliances in Annex A for normal operation and limited operation. The values given in Annex A, Tables A.3 and A.4, apply to dishwashers.

NOTE 1 The attention of the user of this standard is drawn to the possible existence of national regulations or guidelines regarding the pollution levels due to foreign pollutant pollution in the air and micro-organisms.

NOTE 2 Foreign pollutant pollution in the air occur at almost at any time food is heated. The type and amount are influenced particularly by the amount of fat and the temperature, with the ensuing pyrolyzates being possibly damaging to health. These particularly include short-chain aldehydes, such as formaldehyde, acetaldehyde, tr-2 hexenal and acrolein as well as highly-volatile nitrosamines and polycyclic aromatic hydrocarbons (e.g. benzo-a-pyrene).

All types of dish washers require extraction hoods or ventilated ceilings.

To achieve a cost-effective design of the ventilation and supply air systems, the values in Annex A, Table A.1, shall be used.

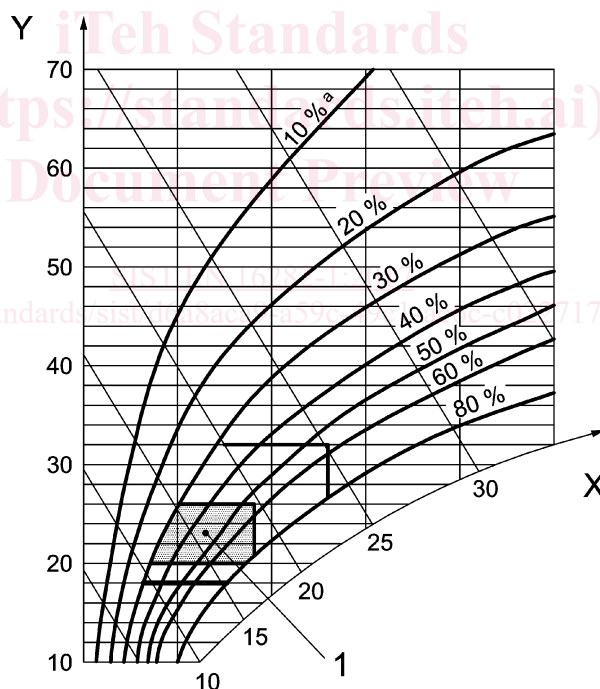
NOTE 3 It might be necessary to cool down inlet air if ambient air is warm and of a high humidity for reasons of hygiene. Partitions between individual preparation areas in kitchens might be necessary particularly for areas requiring different levels of temperature or hygiene.

7 Ergonomic and hygiene requirements

7.1 Thermal comfort, tolerance

For the following it is assumed that kitchen personnel wear clothing with an average clothing insulation corresponding to 0.6 clo. This value shall be used for the relevant comfort parameters in accordance with EN ISO 7730 (humidity, air movement, radiant heat, temperature) given in Figure 1. The ventilation system shall maintain the air quality within range 1 specified in Figure 1.

Air temperature and humidity are measured at a height of 1.10 m above the floor at a distance of 0.50 m from the appliances.



Key

- X Wet bulb temperature in °C
- Y Air temperature in °C
- a Relative humidity in %
- 1 Workplace Range

Figure 1 — Air quality range in kitchens in accordance with EN ISO 7730