SLOVENSKI STANDARD
SIST EN 16282-1:2017

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Oprema za profesionalne kuhinje - Sestavni deli za prezračevanje kuhinj - 1. del: Splošne zahteve, vključno z metodo za izračun

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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ICS:

91.140.30	Prezračevalni in klimatski sistemi	Ventilation and air-conditioning systems
97.040.99	Druga kuhinjska oprema	Other kitchen equipment

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EUROPEAN STANDARD
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English Version

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

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

Bauelemente in gewerblichen Küchen - Einrichtungen zur Be- und Entlüftung - Teil 1: Allgemeine Anforderungen einschließlich Berechnungsmethoden

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 16282-1:2017) 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of an identical text or by endorsement, at the latest by January 2018, and conflicting national standards shall be withdrawn at the latest by January 2018.

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.

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:

EN 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*

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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.

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 applicable to kitchen ventilation systems except those in domestic kitchens.

Unless otherwise specified, the requirements of this standard should 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.

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

EN 13779:2007, *Ventilation for non-residential buildings - Performance requirements for ventilation and room-conditioning systems*

EN 16282-5:2017, *Equipment for commercial kitchens — Components for ventilation in commercial kitchens — Part 5: Air duct; Design and dimensioning*

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)*

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 Terms and definitions

3.1.1
capture velocity
airflow velocity in the free space between the lower part of the hood and the cooking appliance

3.1.2
sensible heat
$\dot{Q}_s$ Heat which results in a change in temperature and is therefore measurable

3.1.3
simultaneity factor φ
ratio of actual power consumption divided by total power of appliances

3.1.4
mixed airflow
air which contains two or more streams of air

3.1.5
extract airflow
air discharged out of the room (negative pressure)

3.1.6
ACH
air changes per hour

3.1.7
ATD
air terminal device

3.1.8
aerosol
separated grease/oil/water mixture

3.2 Symbols and abbreviated terms

a	air diffusion factor	-
b	width	m
D	moisture emission	g/(h kW)
d_{hydr}	hydraulic diameter	m
h_f	height above the floor	m
h_a	appliance height	m
h_d	height above the heat source to the hood/ventilated ceiling	m
k	empirically determined coefficient	$m^{4/3}W^{-1/3}h^{-1}$
L	length	m
q_m	mass flow	kg/h
P	power consumption	kW
ρ	density	kg/m^3
$\dot{Q}_{S,K}$	convectively transmitted proportion of the sensible heat load	W
$q_{v\text{-}t,ext}$	total hood extract volume	m^3/h
r	reduction factor for thermal airflow	-
U	unobstructed perimeter of the hood	m
$q_{v\text{-}th}$	thermal airflow	m^3/h
q_v	volumetric airflow	m^3/h
$q_{v\text{-}ext}$	extract airflow	m^3/h
$q_{v\text{-}com}$	compensation airflow	m^3/h
$q_{v\text{-}cap}$	capture airflows for extraction hoods	m^3/h

$q_{v\text{-}th,ne}$	thermal airflow not extracted	m^3/h
Δq_v	difference in airflow volume	m^3/h
$q_{v\text{-}dir}$	supply airflow blown directly into the hood	m^3/h
v	capture air velocity	m/s
X_{ext}	absolute water content of air, extract air	$kg/kg_{dry\ air}$
X_{sup}	absolute water content of air, supply air	$kg/kg_{dry\ air}$
φ	simultaneity factor	-
$q_{v-th,ne}$	thermal airflow not extracted	-

4 Objectives of kitchen ventilation

The system shall ensure extraction of odours, pollutants and humidity so the indoor air quality shall not be affected negatively. If the extract and supply airflows are designed according to this standard, this requirement concerning the air quality is assumed to be fulfilled.

The ventilation system shall be capable of separating aerosol from the extract air.

NOTE Extract 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;

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 mechanical extract and supply air. All other kitchens shall have at least a mechanical exhaust air system (one passive air inlet may be tolerated).

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/Glass ceramic hob;

— Pastry/Bakery Oven;

— Oven;

— Boiling Pan/Tilting Kettle;

— Bratt Pan/Tilting Skillet;

— Open Top Range and Oven;

— 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;

— type of appliances and connected loads;

— installation and dimensions of appliances;

— simultaneity 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 extract or exhaust air comes into direct contact with the structure of the building, ensure that this does not damage the building structure and that no persistent condensation occurs.

6.2 Heat and pollutant loads

Areas with different pollution loads occur within kitchens. The total heat emission takes place directly due to convection, radiation and latent heat due to the generation of steam and other gaseous components.

Radiant heat intensive areas are characterized by high surface temperatures of cooking appliances. The direct 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 Table A.3 applies 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 substances in the air and micro-organisms.

NOTE 2 Foreign substances 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.

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 Table A.1, shall be used.

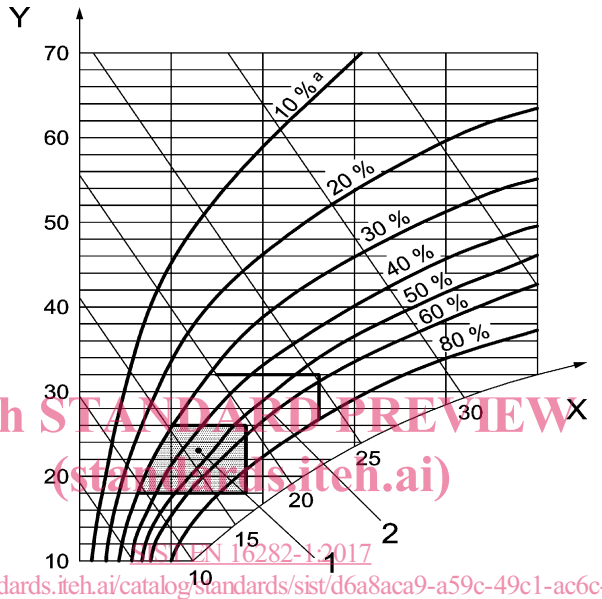
NOTE 3 It might be necessary to cool down inlet air if ambient air is warm and of a high humidity for reasons of hygiene. Partitions between individual preparation areas in kitchens might be necessary particularly for areas requiring different levels of temperature or hygiene.

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). 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 comfort range at the workplace

2 tolerable range at the workplace

Figure 1 — Air quality range in kitchens

It is not always possible to maintain thermal comfort in kitchens. This applies particularly to work areas close to kitchen appliances which are strong heat emitters (latent and sensible heat), e.g. within a distance of approximately 1 m of stoves with heat-radiating surfaces, tilting frying pans, large fryers or dishwashers. In these areas, tolerable climatic conditions according to range 2 of Figure 1 shall be considered.

NOTE If too many heat-emitting cooking appliances are installed in a room which is not sufficiently large enough for the purpose, it might not be possible to meet the ergonomic requirements for ventilating systems.

7.2 Temperature of room air

The temperature of the room air in kitchens and dishwashing area shall be at least 18 °C and shall not exceed 26 °C unless unavoidable due to the processes. This does not include seasonal, excess temperatures or areas in which higher or lower temperatures are unavoidable due to their function.

NOTE Cooling of the room air is required by some national regulations and guidelines.

7.3 Humidity of room air

Because comfortable climatic conditions might not always be achieved in kitchens, the design of a ventilation and air conditioning system can be based on a maximum moisture content of the air of 16,5 g of water per kg of dry air.

NOTE In comfort areas, the upper limit of the moisture content of the air is 11,5 g of water per kg of dry air and 65 % relative humidity.

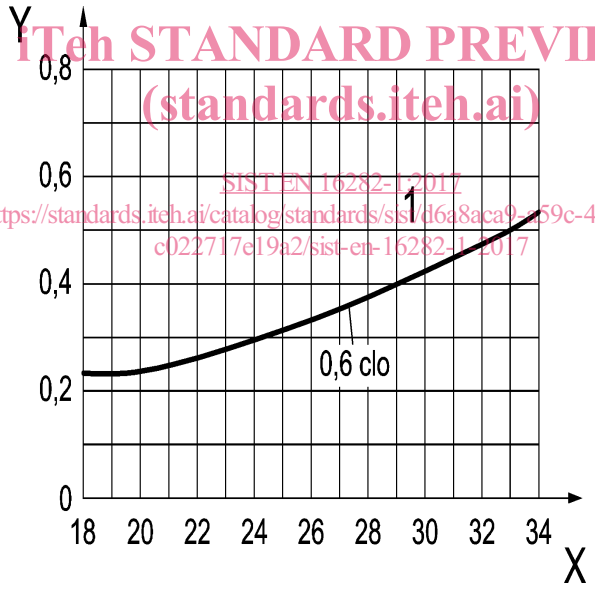
If no reliable data is available regarding the lower limit of the relative humidity of the room air, 30 % relative humidity of the room air may be taken as the comfort limit – as independent as possible from the temperature of the room air – with occasional undershoots being acceptable.

An additional humidification of the air space is not required.

7.4 Air velocity in the room

The limiting values, an example curve is shown in Figure 2 for 0,6 clo, shall not be exceeded. Measurements are generally carried out at the workstation at a height of 1,7 m.

NOTE 1 The limits of the air velocity in the comfort area depend on the temperature of the room air, the turbulence of the flow, the degree of activity and the thermal resistance of the clothing.



Key

X temperature of room air in °C

Y permissible mean air velocity in m/s

1 degree of activity 2

Figure 2 — Example of permissible mean room air velocity as a function of the room air temperature for 0,6 clo

NOTE 2 Draughts due to higher airflow velocities can occur, particularly where there are supply airflows in excess of 90 $m^3/(m^2h)$.