



Product manual

Kitchen hoods

KHE, KHI, KHC

Kitchen ventilation

Version 2.0.5
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BASIC PRINCIPLES IN KITCHEN VENTILATION

Ventilation and air conditioning systems are necessary in commercial kitchens because:

- the air is polluted by odors, particles of fat and gaseous products of combustion
- hygiene requirements must be met with regard to the quality of the room air
- heat is created to a considerable extent due to convection and radiation
- moisture is created by the preparation of meals and by washing
- It is necessary to renew the air in the rooms by an exchange with outside air and maintain comfortable or specified room air temperatures.

To meet this task, supply and exhaust air systems shall be installed in the kitchen areas so that deposits, air pollutants and moisture are drawn off, impairment of rooms not forming part of the kitchen area is avoided and no air which could be considered unhygienic is either supplied or can flow back. Particular attention is to be paid to separating fat from the exhaust air. To minimize the necessary airflows, it is useful to install heat-emitting appliances in continuous blocks or along surfaces forming room boundaries.

If the exhaust air comes into direct contact with the structure of the building, it should be ensured that this does not damage the building structure and that no persistent condensation occurs.

Calculation of required air volume rates

Quantity of air required for kitchen ventilation depends on size and type of kitchen, as well as on kitchen devices and food preparation appliances.

Table 1. presents approximate air volume flow rates (in m³/h per m² of kitchen area). Quantities refer to temperature difference of 8K between ambient air in the kitchen and supply air.

Kitchen type	Airflow per kitchen area [m ³ /h * m ²]	Referring to sections of the kitchen			
		Cooking [m ³ /h*m ²]	Baking and grilles [m ³ /h*m ²]	Dish washing [m ³ /h*m ²]	Ancillary rooms [m ³ /h*m ²]
Buffet	80	-	120	-	-
Inns, Cafeterias	60	105	120	120	45
Canteens Public houses	90	105	120	120	45
Hospital kitchens	90	105	120	150	45
Food preparation	80	105	120	120	60
Ship kitchens	90	120	120	-	60

Table 1. Exhaust volumes per kitchen area

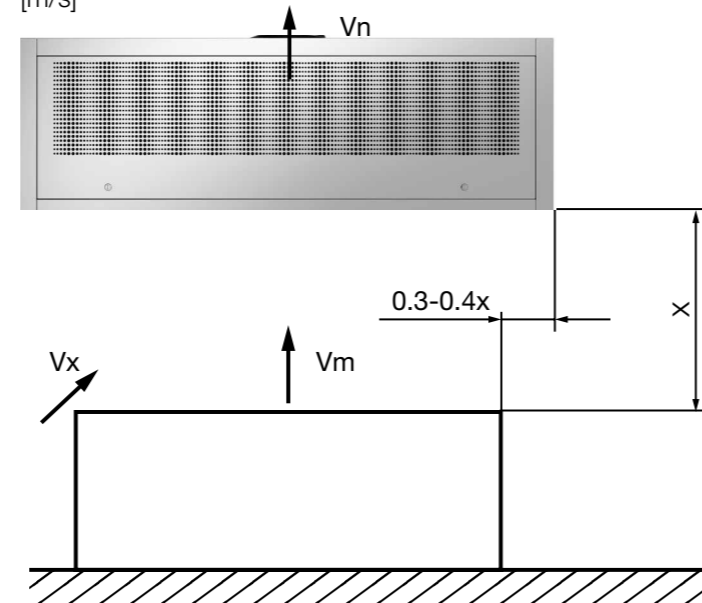
Design of the kitchen ventilation system should take into account:

- the quantity of exhaust air should be somewhat higher (5%) than the quantity of supply air in order to prevent kitchen odors from spreading into adjacent rooms
- opening of the cooking kettle lid may direct the steam plume in wrong direction; therefore it is recommended to increase hood dimension for a certain margin

For purely practical reasons, i.e., in order to achieve the required exhaust of air polluted by vapors, smoke or odors, it is recommended that kitchen ventilation design implements the air quantity values as given suggested in this manual. If considerably lower design air quantities were taken, the exhaust rate would not be sufficient, especially in case of stronger air cross-flow above the working surface of the kitchen. Required air flow rate can be calculated using two expressions (acc. to Recknagel/Sprenger):

$$V = 2 \cdot O \cdot x \cdot v_x \text{ [m}^3\text{/s]} \text{ or } V = 1.4 \cdot O \cdot x \cdot v_m \text{ [m}^3\text{/s]}$$

- O- Hood perimeter [m]
- v_x - Air velocity at the working surface outer edge [m/s]
- x - Distance between working surface and hood [m]
- v_N - Air velocity at hood inlet [m/s]
- v_m - Mean air velocity between hood and working surface [m/s]



Drawing 1. Physical quantities for airflow calculation

Velocity v_x and v_m [m/s] empirical values:

- In still air $v_x = 0.10 - 0.15;$
 $v_m = 0.2 - 0.3$
- With weak cross-flow $v_x = 0.15 - 0.30;$
 $v_m = 0.3 - 0.4$
- With strong cross-flow $v_x = 0.20 - 0.40;$
 $v_m = 0.4 - 0.5$

Velocity v_N [m/s] empirical values:

- For hoods with free air access from 4 sides v_N = 0.9 - 1.2
- For hoods with free air access from 3 sides v_N = 0.8 - 1.1
- For hoods with free air access from 2 sides v_N = 0.7 - 0.9
- For hoods with free air access from 4 side v_N = 0.5 - 0.8

Heat and humidity loads

Areas with different pollution loads occur within kitchens. The total heat emission takes place directly due to convection radiation and latently due to the generation of steam and other gaseous components. Radiation-intensive areas are characterized by high surface temperatures. These include preparation areas with grills and salamanders, grill plates, tipping frying pans, stoves etc.

Foreign substances in the air occur almost any time food is heated. The type and amount are influenced particularly by the amount of fat and the temperature, with the ensuing pyrolyzes being possibly damaging to health. These particularly include short-chain aldehyde's, such as formaldehyde, acetaldehyde, tr-2 hexenal and acrolein as well as highly-volatile nitrosamines and polycyclic aromatic hydrocarbons (e.g. benzo-a-pyrene). Calculation of the required air flow rate based on heat balance in the room/kitchen (acc. VDI 2052, E 3.81) referring to temperature difference of Δt= 8K (acc. to Recknagel/Sprenger):

$$\dot{V} = \frac{\sum (P_i \cdot \psi_i \cdot \eta_i) \cdot \varphi \cdot 3600}{\rho \cdot c_p \cdot (t_p - t_z)} \text{ [m}^3\text{/s]}$$

- v - required air flow rate [m³/h]
- P_i - Installed output of each individual kitchen device [kW]
- Ψ_i - Dissipated heat per 1 kW of installed device output [kJ/kW]
- η_i - Kitchen device efficiency, normally 0.8
- ρ - Air density 1.2 kg/m³
- c_p - Specific heat of air [kJ/kgK]
- Δt_z - Air Temperature difference (tp-tz) [K]
- t_p - Room air temperature
- t_z - Supply air temperature
- φ - Factor of simultaneous operation of devices:

- for small kitchens: 0.8 - 1.0
- for medium kitchens: 0.5 - 0.8
- for large kitchens: 0.5 - 0.8

Calculation of required air flow for removal of latent moisture:

$$\dot{V} = \frac{\sum (P_i \cdot D_i \cdot \eta_i)}{(X_p - X_z) \cdot \rho}$$

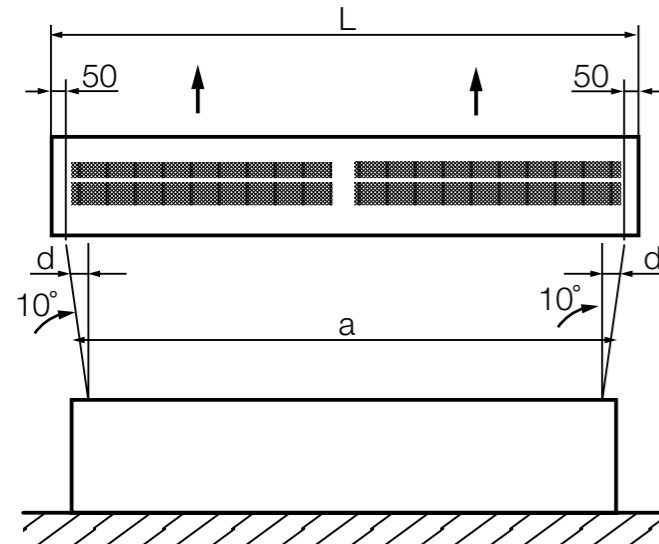
- D_i - Vapor (moisture) content per 1 kW of installed output of kitchen devices [g/h *kW]
- X_p - Vapor content of room air [g/kg]
- X_z - Vapor content of supply air [g/kg]

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DESIGN PRINCIPLES

Hood Size

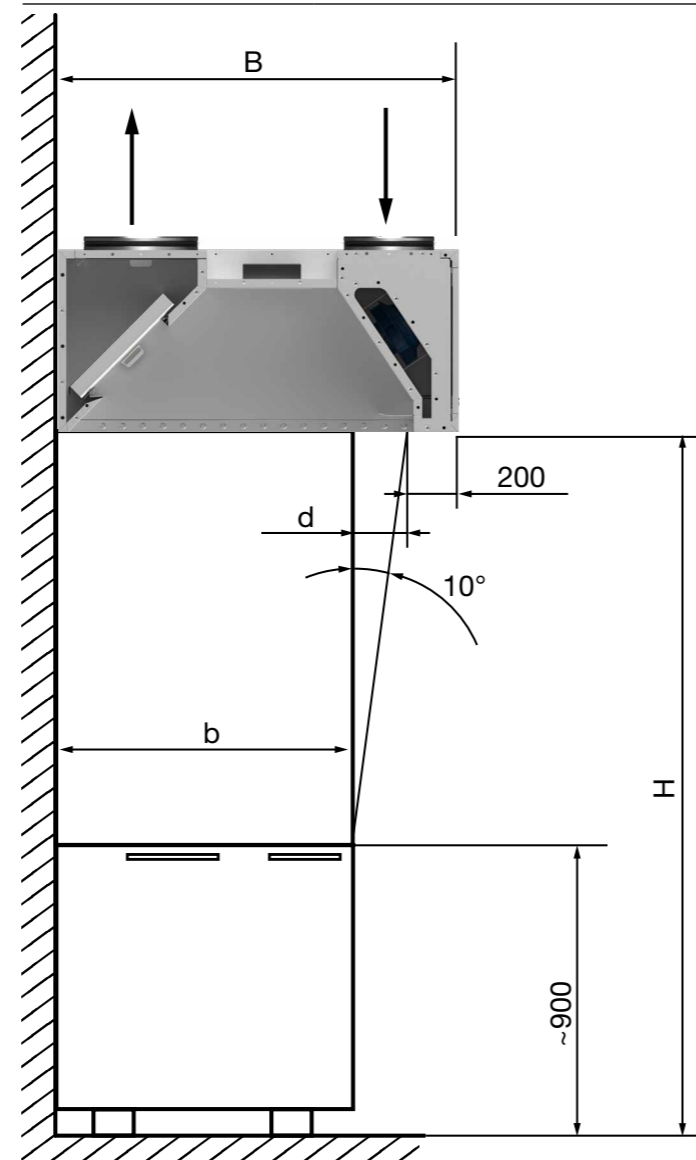
Hood size is defined by the size (dimensions) of kitchen devices from which polluted air is exhausted. For example, if a hood hangs above a drawer-type oven, dimensions of the hood are defined taking into account the ground plan of the oven with opened drawers. After dimensions of a certain hood type are defined or calculated, a typical size of the hood should be selected from technical data given in this manual. If the calculated value differs from typical dimensions given in the table, a higher value/dimension should be selected, especially when the hood width is concerned.



Hoods installed at height $H = 2.1$ m from floor, perimeter of a kitchen-hood edges should oversize the ground plan of the working surface for an excess of $d = 100$ mm. If the hood is at height $H = 2.1$ m, then the key parameter is an angle 10° which defines the appropriate value of the excess "d" (see figure below). When energy-saving hoods are concerned, the hood width should be additionally increased for the width of outer, inactive edge, i.e., for 200 mm by wall hoods and 400 mm by ceiling hoods. It should be taken into account that, when opened, lids of cooking kettles or washed pots can act as directing panels. Vapour clouds released from these devices may require higher than minimum excess value "d" in order to be exhausted.

Recommended Minimum Hood Dimensions

For $H = 2100\text{mm}$	For $H > 2100\text{mm}$
CONVENTIONAL WALL HOOD $B = b+d = b+100$ $L = a+2d = a+200$	CONVENTIONAL WALL HOOD $B = b+d$ $L = a+2d$
CEILING HOOD $B = b+2d = b+100$ $L = a+2d = a+200$	CEILING HOOD $B = b+2d$ $L = a+2d$
INDUCTION WALL HOOD $B = b+d+200 = b+300$ $L = a+2d = a+200$	INDUCTION WALL HOOD $B = b+d+200$ $L = a+2d$
CEILING HOOD $B = b+2d+2\cdot 200 = b+600$ $L = a+2d = a+200$	CEILING HOOD $B = b+2d+2\cdot 200 = b+2d+400$ $L = a+2d$



*Excess value "d" For $H > 2100$ mm

H [mm]	d [mm]
2150	220
2200	230
2250	240
2300	250
2350	260
2400	265

Example 1:

Given:

- dimension of the working surface $a \times b = 2100 \times 900$
- height to the lower edge of the hood $H = 2,1$ m

Required:

- size of the conventional wall hood
- size of the induction wall hood

Solution:

- **Conventional wall hood**

$$B = b+d+200 = 900+100=1000 \text{ (see table A page 4.)}$$

$$B = 1000$$

$$L = a+2d = 2100+2\cdot 100 = 2300 \text{ (see table A page 4.)}$$

$$L = 2300$$

Ordering data:

KHE 2300 x 1000 x 400 - W

Induction wall hood

$$B = b+d+200 = 900+100+200 = 1200 \text{ (see table B page 4.)}$$

$$B = 1200$$

$$L = a+2d = 2100+2\cdot 100 = 2300 \text{ (see table B page 4.)}$$

$$L = 2300$$

Ordering data:

KHI 2300 x 1200 x 550 - W

Example 2:

Given:

- dimensions of the working surface $a \times b = 2100 \times 900$
- height of the lower edge of the hood $H = 2,3$ m

Required:

- size of the conventional wall hood
- size of the induction wall hood

Solution:

- **Conventional wall hood**

$$B = b+d = 900+250=1150 \text{ (see table A page 4.)}$$

$$B = 1300$$

$$L = a+2d = 2100+2\cdot 255 = 2600 \text{ (see table A page 4.)}$$

$$L = 2700$$

Ordering data:

KHE 2700 x 1200 x 400 - W

- **Induction wall hood**

$$B = b+d+200 = 900+250+200 = 1350 \text{ (see table B page 4.)}$$

$$B = 1500$$

$$L = a+2d = 2100+2\cdot 255 = 2600 \text{ (see table B page 4.)}$$

$$L = 2700$$

Ordering data:

KHI 2700 x 1500 x 550 - W

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SECTION OF THE KITCHEN	TYPES OF KITCHEN DEVICES	ELECTRICAL DEVICES				GAS DEVICES			
		Normal use ^a		Limited use ^b		Normal use ^a		Limited use ^b	
		Emission of heat	Moisture	Emission of heat	Moisture	Emission of heat	Moisture	Emission of heat	Moisture
		W/kW	g/(hkW)	W/kW	g/(hkW)	W/kW	g/(hkW)	W/kW	g/(hkW)
COOKING	- boiling pans and automatic boiling pans	35	441	25	118	100	441	75	118
	- pressure cookers	40	15	-	-	-	-	-	-
	- high pressure steamers, slide-in appliances	25	294	25	0	-	-	-	-
	- high pressure steamers Push-through appliances (appliance with a front and back door)	25	294	25	0	-	-	-	-
	- combination ovens	120	265	70	147	150	265	85	147
BAKING HOTPLATE FRYING	- tilting frying pans	450	588	250	220	450	630	450	368
	- roasting, grilling and griddle plates	330	588	200	175	350	588	250	220
	- grilling and salamander appliances	800	257	700	257	720	294	720	294
	- roasting and baking ovens	350	235	250	235	350	294	250	294
	- hot air appliances/thaving appliances	70	220	40	88	100	220	50	147
	- automatic roasting and grilling appliances for quick fried food	250	338	250	338	-	-	-	-
	- automatic sauce appliances	150	235	110	235	-	-	-	-
	- deep fryers	90	1030	-	-	90	1030	-	-
	- automatic tunnel deep fryers ^c	50	147	-	-	-	-	-	-
	- automatic tunnel deep fryers ^d	50	808	-	-	-	-	-	-
	- induction hob	70	41	35	74	-	-	-	-
	- ceramic cooker	200	118	100	74	200	118	1120	94
	- wok	70	41	-	-	450	630	-	-
	Multi-purpose area for: -BAKING -THAWING -TEMPERATURE MAINTAINING -COOLING -MEAL PREPARATION -MEAL TRANSPORT	- cookers, cooking points ^e	200	118	100	74	250	147	150
- stockpot cooker		200	220	150	147	250	265	200	176
- microwawe appliances		50	15	-	-	-	-	-	-
- waterbaths		125	194	-	-	195	323	-	-
- warm cupboards		350	-	-	-	350	-	-	-
- refrigerators		700	-	-	-	-	-	-	-
- kitchen appliances		300	-	-	-	-	-	-	-
MEAL SERVING	- transportation devices ^f	1000	-	-	-	-	-	-	-
	- warm meals self-service	125	-	-	-	-	-	-	-
	- cold meals self-service	700	-	-	-	-	-	-	-
	- dish dispensing	300	-	-	-	-	-	-	-
	- serving beverages	100	-	-	-	-	-	-	-

^a Normal operation: simultaneous, correct use of several devices for frying, grilling, baking, cooking, annealing.

^b Limited operation: during periods of reduced activity with partial use of cooking appliances, steam cooking, defrosting, reheating, heat retention, low temperature cooking, and the like.

^c With built-in remover

^d Without built-in remover

^e Multiplied by factor for kitchen hobs: - Electric cooker factor (Solid kitchen hob: 1, Ceramic hob: 1, Induction hob: 0.35, Large surface steel plate: 1.3)

- Factor for gas hobs (Open cooking space: 1, Glossy hob: 1.2, Ceramic hob: 0.8)

^f Total output is emitted into space as heat.

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Notes for special devices

- K = hemispherical pot, calculated as cooking point (eg induction wok, nominal consumption x value from table x kitchen hob factor)
- Pasta cooker, counts as a boilie pan
- Pressure cooker (braiser), counts as a pressure boiling pan or where it is used constantly for fast frying, counts as a tilting frying pan
- Chicken grill, counted as salamander or combination ovens
- Rotary grill, counted as a frying pan or frying plate.
- Contact grill, counts as frying plate
- Roasting spit, open, is calculated as a combination of furnaces or in accordance with the manufacturer's data.

NOTE 1. To calculate the thermal airflow for cabinet devices, the average height of the device for determining hd will be used. (see Figure 3).

NOTE 2 Equipment with higher power consumption during start-up can be calculated with a value for normal operation.

Air velocity and sound proofing

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 (refer to DIN 1946-2). The limits shall be maintained up to a volume rate of flow relative to area of 35 m³/(m² h).

The pressure level emitted by a ventilation and air conditioning system shall be limited to 50 dB to 60 dB, according to requirements, measured at a height of 1.7 m above the floor (refer also to VDI 2080). Maximum pressure level of 50 dB is recommended where the meal delivery point is open. Value of 65 dB shall not be exceeded for sculleries. Sound levels and flows should be optimized when designing ventilation and air conditioning systems, particularly with a view to minimizing the use of sound absorbing measures in the exhaust air. This also means that the sound power level of the extraction fan will be minimized. Sound-absorbing surfaces can also be used in the room as additional sound insulation, but this must be consistent with the requirements of hygiene. The sound pressure levels permissible in other parts of the building shall not be exceeded by the ventilation and air nance.

If different levels of hygiene requirements are required for different areas of the kitchen, this can be aided by appropriate airflows in the room. The total of all airflows (supply air and exhaust air) should be balanced in the overall kitchen area. The recirculation of air from rooms where the hygiene is questionable shall be precluded.

The spread of odors within the building shall be prevented by additional exhaust air which is drawn off in suitable forward rooms. Ventilation and air conditioning systems may be operated using external air only. Recirculated air shall not be used. Hygiene requirements shall be jointly agreed with the kitchen designer, the operator and, where necessary, the supervisory authorities. conditioning system.

Kitchen area	Temperature
Meat preparation	15 - 18 °C
Vegetables, salad and potato preparation	18 - 20 °C
Cold kitchen	17 - 20 °C
Storeroom for cook & chill meals	0 - 3 °C
Distribution room for meals prepared by the cook & chill system	12 - 14 °C

Room air temperature in °C	Room humidity in %
20	80
22	70
24	62
26	55

Ergonomic and hygiene requirements

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 direct 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 DIN 33403-3 should be guaranteed as a minimum. Taking account of the clothing normally worn in kitchens and the work energy expenditure of the personnel to be expected, the condition of the air should lie within tolerable climatic ranges.

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

The temperature of the room air within the meaning the Factories Order is the temperature in degrees Celsius measured at a height of 0.75 m above the floor in the center of the closed room (or other comparable point). Cooling of the room air is normally not necessary unless required in certain areas due to foodstuffs regulations or for reasons of hygiene.

Guidelines on this are given in Table 1.

The relative humidity in the occupied zone shall not exceed the values given in Table 2

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. Because comfortable climatic conditions cannot always be achieved in kitchens, the design of a ventilation and air conditioning system may be based on a maximum moisture content x of the air of 16.5 g of water per kg of dry air. No reliable data is available regarding the lower limit of the relative humidity of the room air. 30 % relative humidity of the

room air can be taken as the comfort limit - as independent as possible from the temperature of the room air-with occasional undershoots being acceptable.

From the point of view of hygiene, the task of a ventilation and air conditioning system for kitchens is also to prevent the contamination of food by the airflow during preparation, storage and distribution and to prevent an undefined spread of odors, pollutants and other gaseous substances by the airflow. To meet these tasks, hygiene requirements must be set for individual components, system concepts and maintenance.

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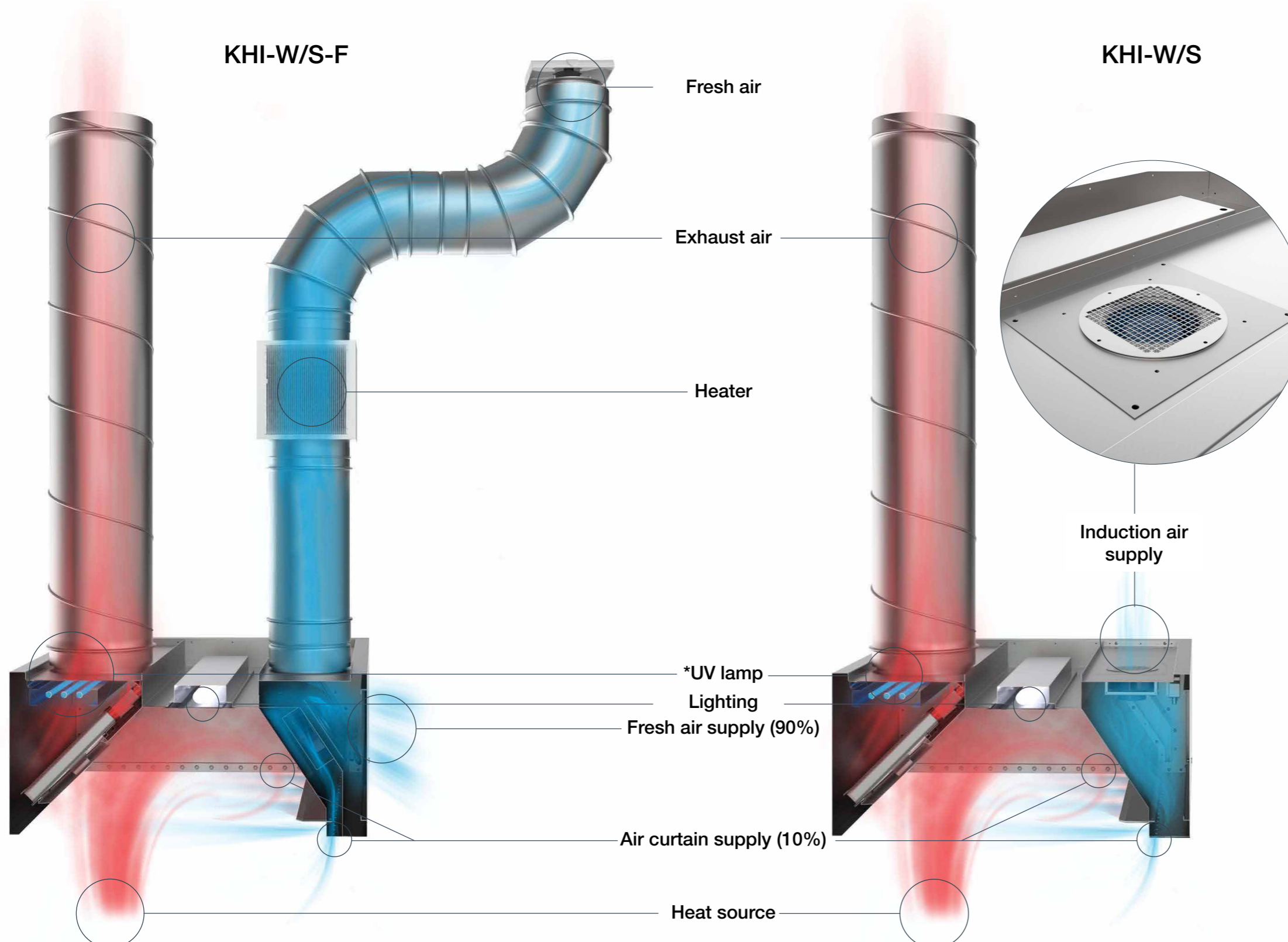
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System components

Air supply

When designing a kitchen it is necessary to provide a underpressure to ensure the supply of air (3-5%) from the surrounding rooms. This prevents the spread of unpleasant odors to the surrounding rooms. The recommended supply air temperature should be 18-20 ° C.



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DESIGN PRINCIPLES

Filters KCF

Cyclone filters use centrifugal force to extract grease particles with efficiency of up to 95%. When greasy air enters cyclonic filter, it is forced to transform its path into a series of spirals. The grease particles in the rotating streams have too much inertia to follow a spiral curve of the air stream. As a result, the particles collide with the inner walls of filter channels and permanently stick to it.

KCF filters are produced in single dimension 500x360, and are produced from AISI 304 or 316 on special request.

Cyclone filters have the highest extraction efficiency while maintaining the lowest pressure loss of any mechanical filtration device. The efficiency limits grease deposition inside the exhaust plenums of hood and ventilated ceilings and the ductwork. This in turn reduces the energy consumption and greatly reduces the cleaning costs.

- The efficiency of the KCF filters is up to 95% (measured for 10 µm particles and 130Pa pressure loss)
- Reduced cleaning and maintenance costs due to high efficiency grease extraction
- Lower noise and pressure drop levels
- Compatible to use in combination with UV Ozone system for high demand applications

KCF filters are tested and approved in EN12238 accredited laboratory. Tests were carried out for aerosol separation efficiency and flame penetration according to the EN 16282 "Equipment for commercial kitchens - Components for ventilation in commercial kitchens - Part 2: Kitchen ventilation hoods; design and safety requirements".

Benefits of using KCF filters with UV-C Ozone System

UV-C Ozone System is used in applications where there is a need for neutralization of medium and small sized grease particles. In combination with KCF filters the UV-C Ozone System provides a high efficiency filtration for the whole range of the particle sizes.

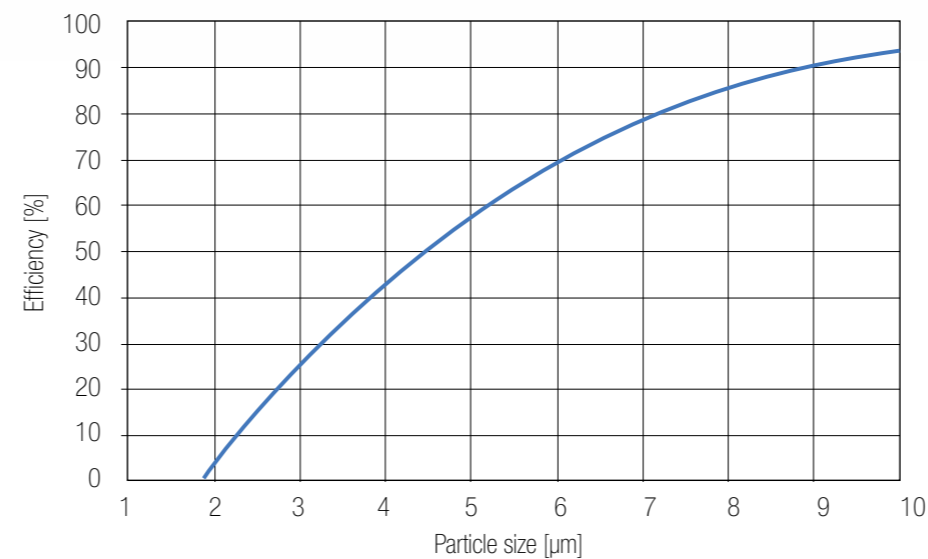
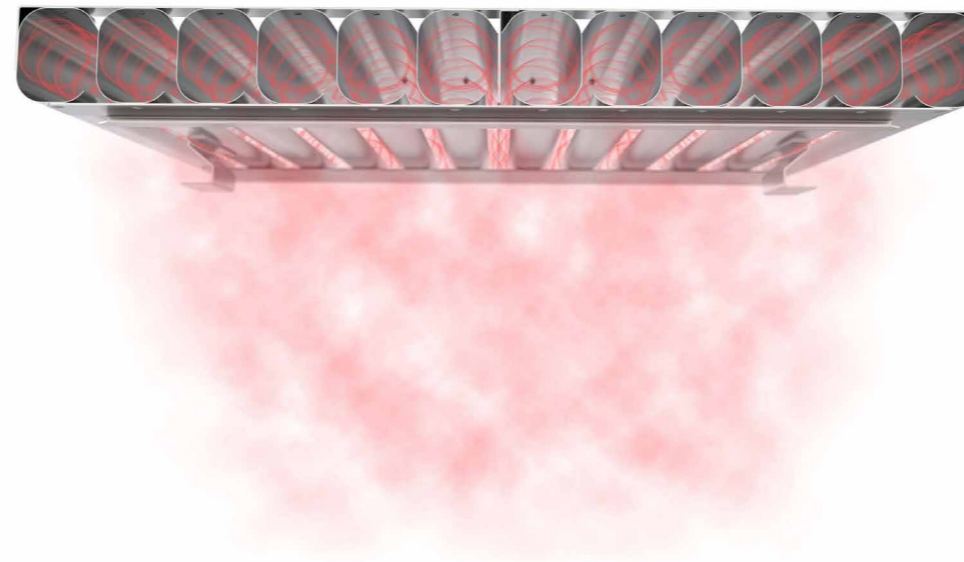


Diagram of particle separation efficiency per particle size. Tests are conducted at 130Pa filter pressure drop and 1500 [m³/h * m] of exhaust airflow.

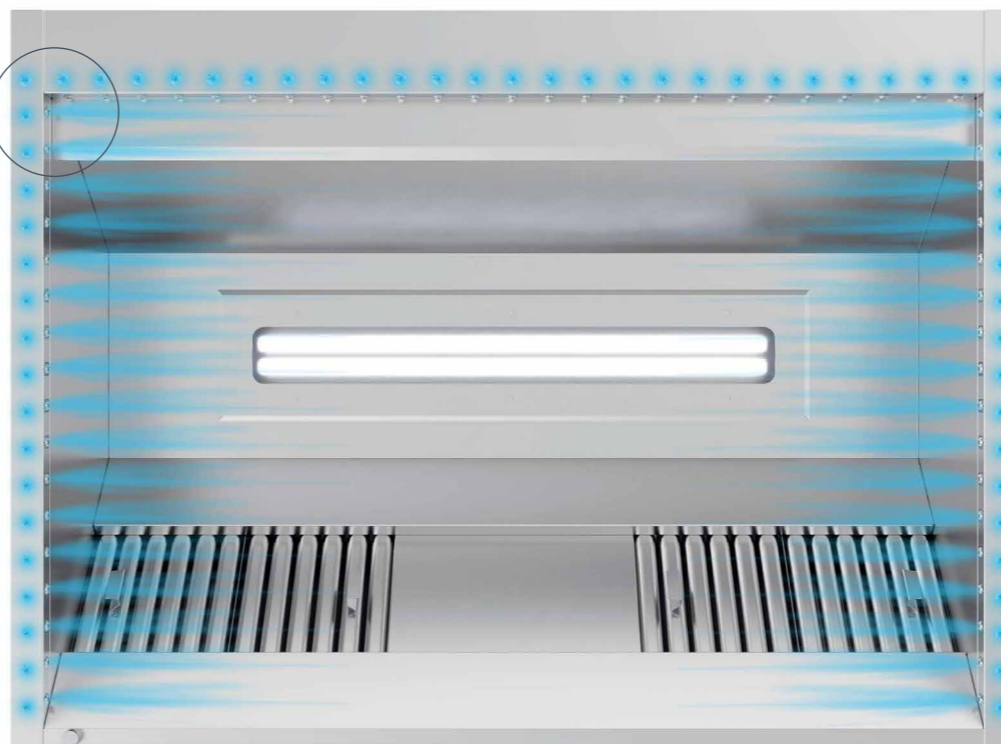
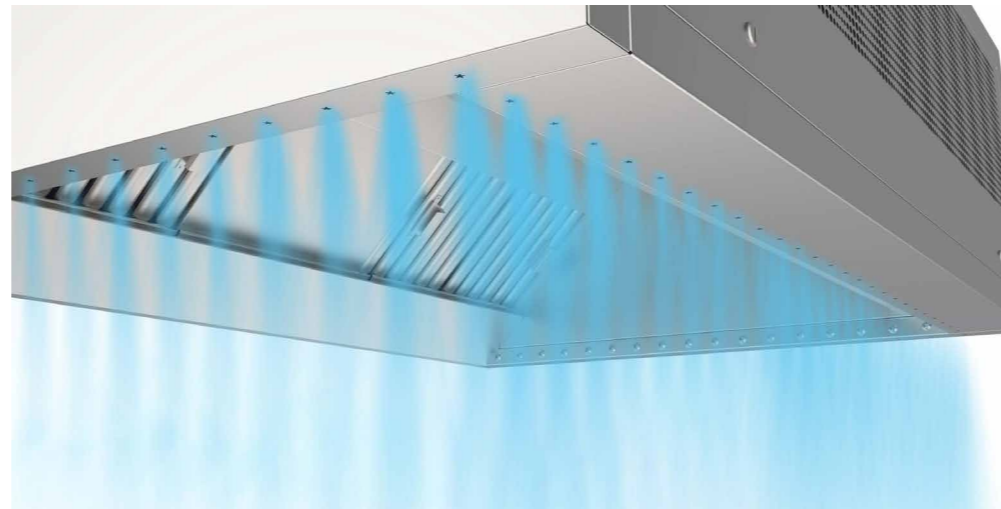


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DESIGN PRINCIPLES

Induction nozzles

Dadanco's breakthrough, patented induction nozzles address shortcomings in traditional induction systems relating to floor space, appearance, noise levels, cooling capacities and energy consumption. Patented star shaped design provides higher air entrainment ratios compared to the similar round shaped ones. Consequently lower air volumes can be used, creating less pressure drop and noise for the same effect. The nozzles design was performed using CFD optimization process and its benefits were confirmed in the testing laboratory.



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Induction supply fan

KHI range of kitchen hoods are equipped with patented Dadanco TM air supply jet nozzles. A constant pressure air fan is supplying the jet nozzles with the supply air. The fan is controlled via control unit that is installed in the supply chamber, and is measuring and controlling the static overpressure in the chamber. Set-point is calibrated and adjusted in the factory at 60Pa of overpressure in the air supply chamber. More information on the documentation of the presostat controller can be found here: www.hkinstruments.fi



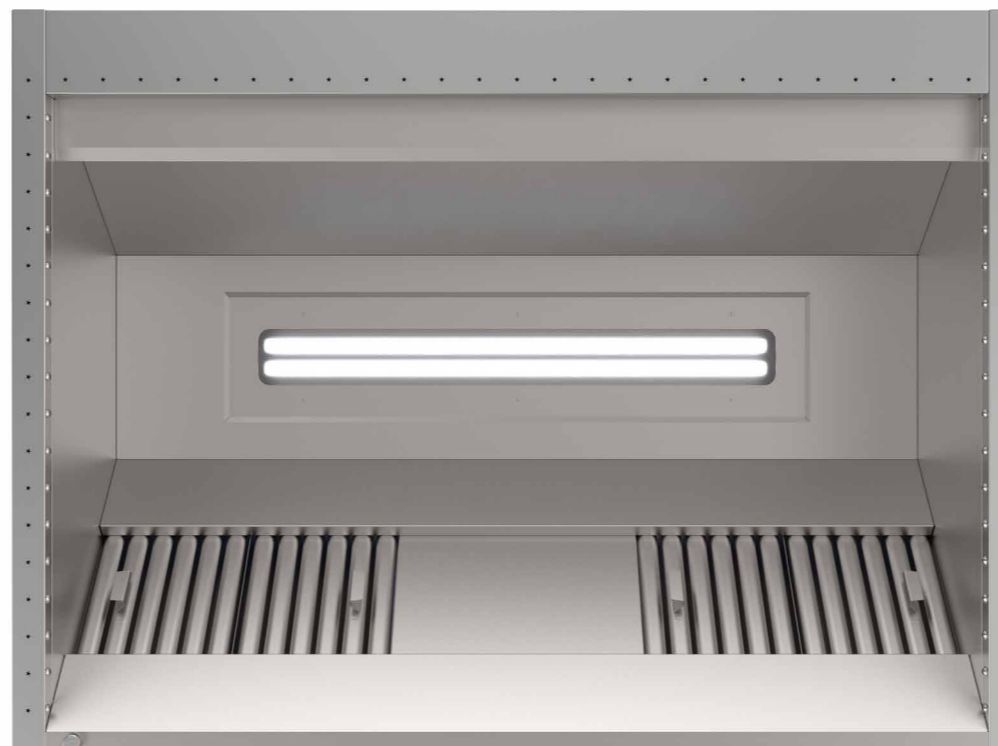
Exhaust balancing damper

All exhaust kitchen hoods come equipped with a balancing exhaust damper as standard. The mechanism is designed as a sliding damper for reliable adjustment and easy cleaning. Each exhaust connection is equipped with its own damper for easy balancing of the exhaust.



Lighting fixtures

Lighting fixtures are part of the standard equipment of all kitchen hoods. Energy efficient LED T8 tubes, 4000K are mounted in all fixtures. Dimensions and number of fixtures vary on the size of the kitchen hood. Casings of the fixtures are watertight and made out of the same type stainless steel as the rest of the kitchen hood. The flush design is made for easy cleaning and maintenance.



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KHI Induction kitchen hood

W-Wall installation
S- Space installation
F- Fresh air supply

KHI induction kitchen hood is the most technologically advanced design from Klimaoprema kitchen hood range. It includes fresh air supply via patented Dadanco™ jet nozzles and perforated supply air diffusers. It can be produced in wall or space type installation. Standard equipment include LED lighting and regulation damper. On the exhaust side new cyclone effect grease filters provide high efficiency particle removal. For even higher standards of exhaust emissions, UV Ozone System is available as an accessory. It ensures almost no maintenance, fat-free ducts and deodorization of the exhaust fumes. Standard material is AISI 304/EN 1.4301, optional AISI 316/EN 1.4401. Front perforation is an option and it is used to release air into the room to avoid pressure. The hoods are developed in accordance with the standard EN 16282-2_2016, while the cyclone filter complies with the standard EN 16282-6_2020.



KHE Conventional kitchen hood

W-Wall installation
S- Space installation
A- Angled version

KHE is a convectional kitchen hood design. It can be produced in wall or space type configuration. Standard equipment include LED lighting and regulation damper. On the exhaust side new cyclone effect grease filters provide high efficiency particle removal. For even higher standards of exhaust emissions, UV Ozone System is available as an accessory. It ensures almost no maintenance, fat-free ducts and deodorization of the exhaust fumes. Standard material is AISI 304/EN 1.4301, optional AISI 316/EN 1.4401. The hoods are developed in accordance with the standard HRN EN 16282-2_2016, while the cyclone filter complies with the standard EN 16282-6_2020.



KHC Condensation exhaust hood

W-Wall installation

KHC are dedicated kitchen hoods specially designed for exhaust of water vapour and steam. Standard equipment include LED lighting and circular duct connections with regulation damper. On the exhaust side, water condensation baffles are installed. Standard material is AISI 304/EN 1.4301, optional AISI 316/EN 1.4401. The hoods are developed in accordance with the standard EN 16282-2_2016.



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KHI-W Induction kitchen hood

- Wall installation
- Dadanco™ nozzles
- LED lighting
- Circular duct connections with regulation damper
- KCF cyclone filter
- Standard material AISI 304/EN 1.4301

Optional

- UV Ozone System
- Optional material AISI 316/EN 1.4401
- Rectangular connection



- ▼ Design principles
- ▼ Product range
- ▼ Ordering key
- ▼ Installation
- ▼ Air volume / Pressure drop
- ▼ Accessories
- ▼ Maintenance



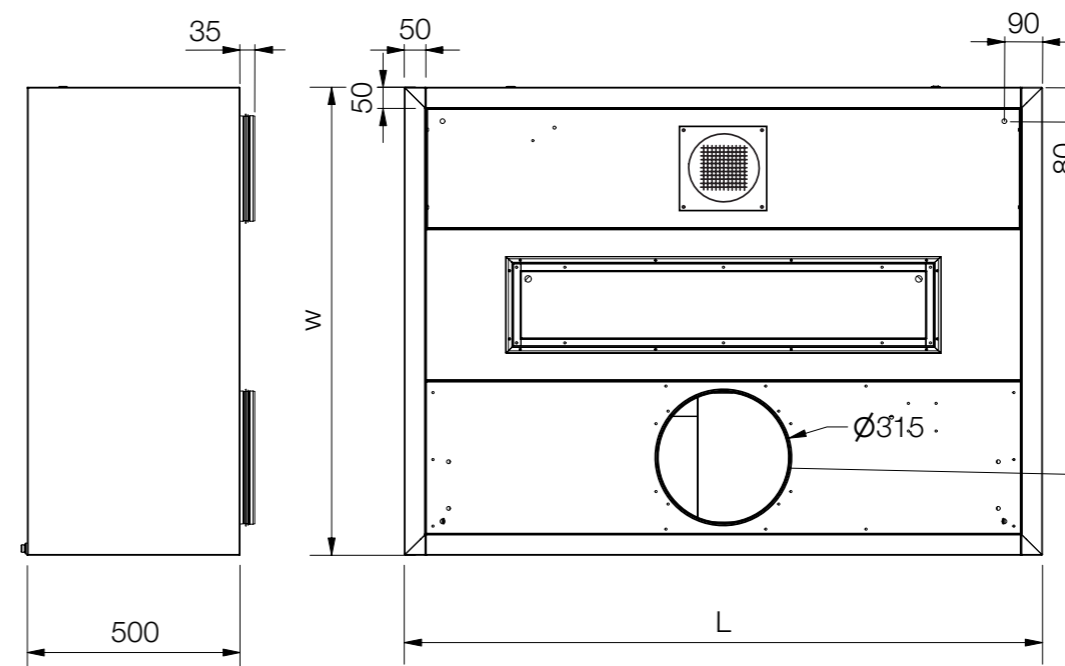
KHI

KITCHEN VENTILATION

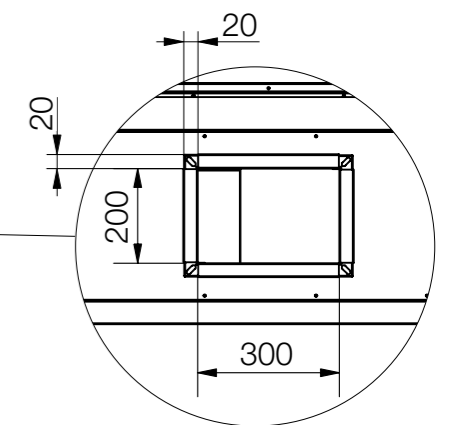
DIMENSIONS

KHI-W	Number of filters	Number of exhaust connections	Lighting LED 4000K			Suspension points
			Number of lighting fixtures	Power	Length	
L x W						
1100	1	1	1	2x10W	720	4
1300	2		1		720	4
1500	2		1	2x15W	1025	4
1700	3		1		1025	6
1900	3		2	1	2x20W	1330
2100	3	1		1330		6
2300	4	1		2x25W	1630	6
2500	4	1	1630		8	
2700	5	2	2	2x15W	1025	8
2900	5		2		1025	8

Circular connection details



Rectangular connection details



[More dimensions](#)

KHI-W-F Induction kitchen hood

- Wall installation
- Dadanco™ nozzles
- Fresh air supply
- LED lighting
- Circular duct connections with regulation damper
- KCF cyclone filter
- Standard material AISI 304/EN 1.4301

Optional

- UV Ozone System
- Optional material AISI 316/EN 1.4401
- Rectangular connection



- ▶ Design principles
- ▶ Product range
- ▶ Ordering key
- ▶ Installation
- ▶ Air volume / Pressure drop
- ▶ Accessories
- ▶ Maintenance



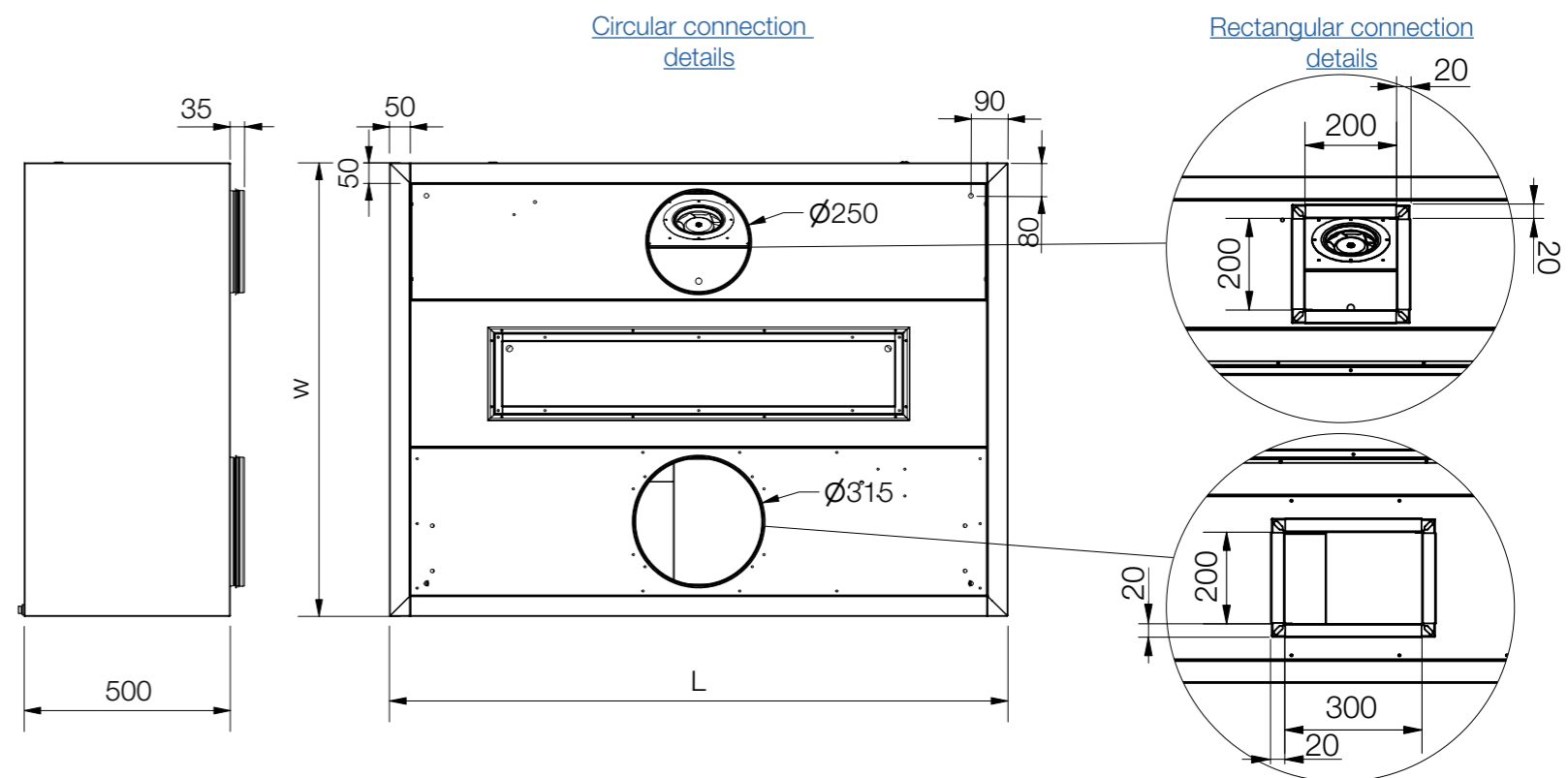
KHI

KITCHEN VENTILATION

DIMENSIONS

KHI-W-F	Number of filters	Number of exhaust connections	Number of supply connections	Lighting LED 4000K			Suspension points
				Number of lighting fixtures	Power	Length	
L x W							
1100	1			1		720	4
1300	2			1	2x10W	720	4
1500	2	1	1	1	2x15W	1025	4
1700	3			1		1025	6
1900	3			1	2x20W	1330	6
2100	3			1		1330	6
2300	4			1	2x25W	1630	6
2500	4	2	2	1		1630	8
2700	5			2	2x15W	1025	8
2900	5			2		1025	8

[More dimensions](#)



KHI-S Induction kitchen hood

- Space installation
- Dadanco™ nozzles
- LED lighting
- Circular duct connections with regulation damper
- KCF cyclone filter
- Standard material AISI 304/EN 1.4301

Optional

- UV Ozone System
- Optional material AISI 316/EN 1.4401
- Rectangular connection



- ▼ Design principles
- ▼ Product range
- ▼ Ordering key
- ▼ Installation
- ▼ Air volume / Pressure drop
- ▼ Accessories
- ▼ Maintenance



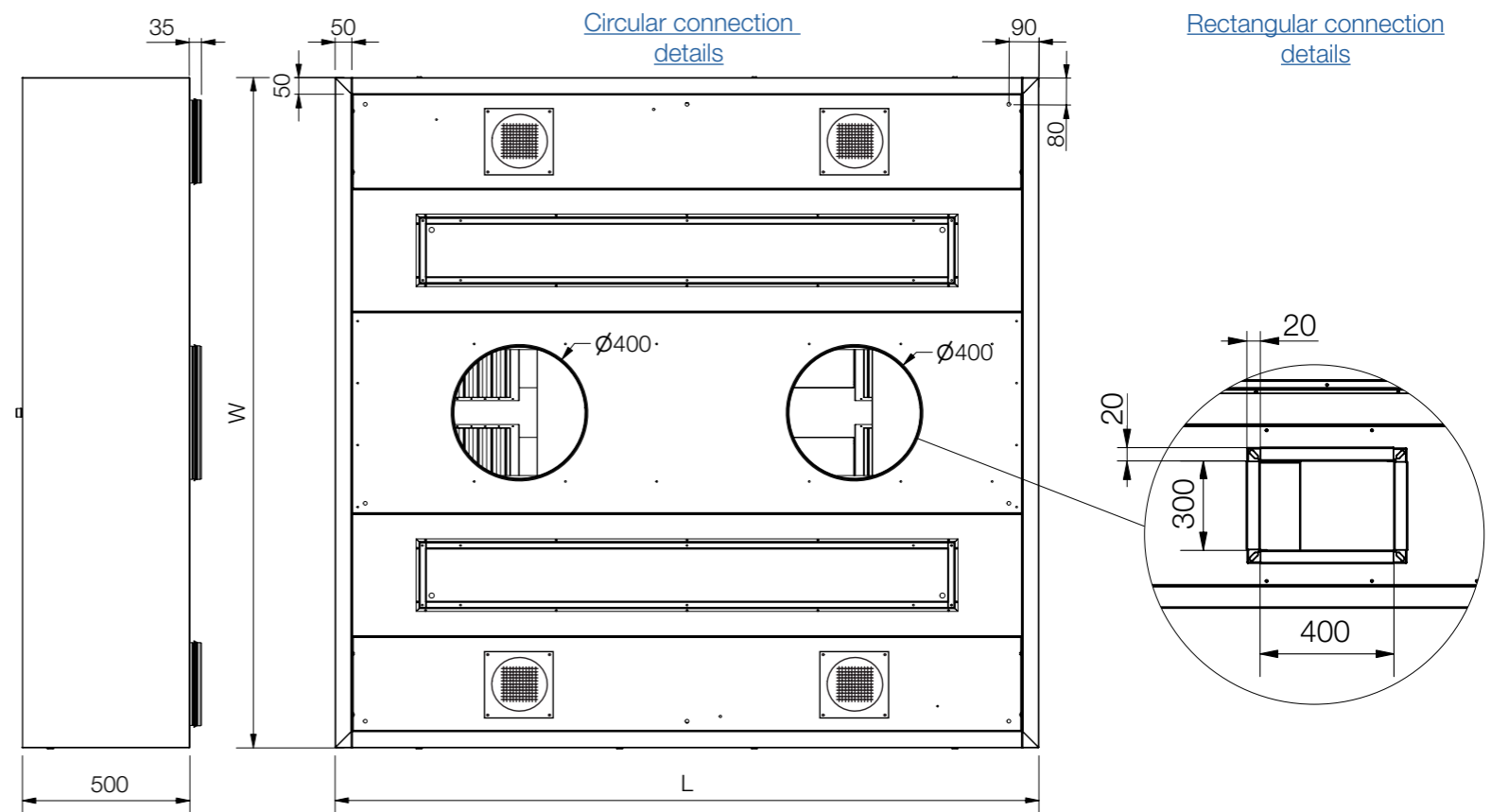
KHI

KITCHEN VENTILATION

DIMENSIONS

KHI-S		Number of filters	Number of exhaust connections	Lighting LED 4000K			Suspension points
L x W				Number of lighting fixtures	Power	Length	
1100	1800,	2	1	2	2x10W	720	6
1300	2000,	4		2		720	
1500	2200,	4		2	2x15W	1025	6
1700	2400,	6		2		1025	
1900	2600,	6		2	2x20W	1330	8
	2800	6		2			

[More dimensions](#)



KHI-S-F Induction kitchen hood

- Space installation
- Dadanco™ nozzles
- Fresh air supply
- LED lighting
- Circular duct connections with regulation damper
- KCF cyclone filter
- Standard material AISI 304/EN 1.4301

Optional

- UV Ozone System
- Optional material AISI 316/EN 1.4401
- Rectangular connection



- ▶ Design principles
- ▶ Product range
- ▶ Ordering key
- ▶ Installation
- ▶ Air volume / Pressure drop
- ▶ Accessories
- ▶ Maintenance



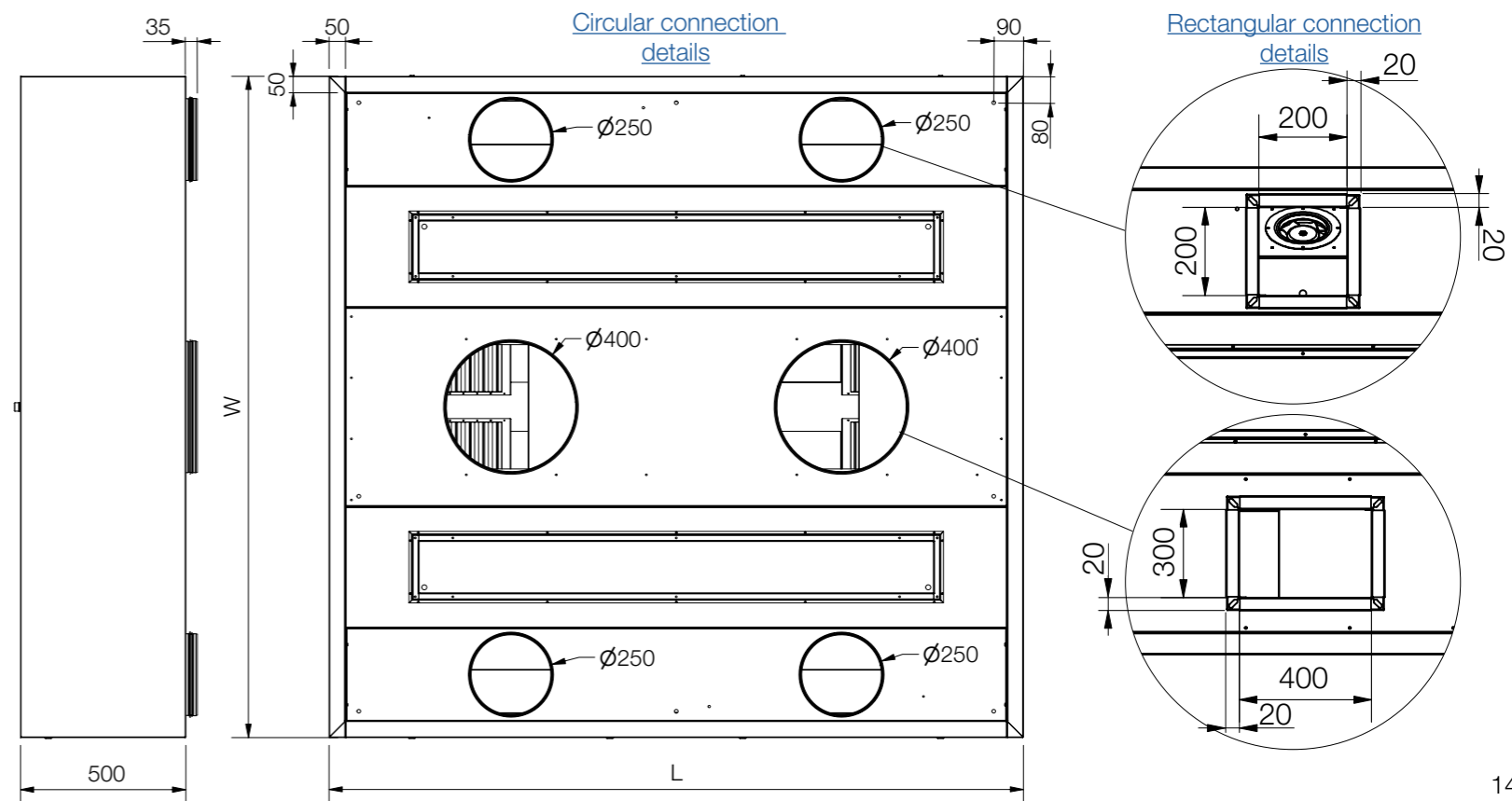
KHI

KITCHEN VENTILATION

DIMENSIONS

KHI-S-F		Number of filters	Number of exhaust connections	Number of supply connections	Lighting LED 4000K			Suspension points
L x W	Number of lighting fixtures				Power	Length		
1100	1800,	2			2	2x10W	720	6
1300	2000,	4			2	2x10W	720	6
1500	2200,	4	1	2	2	2x15W	1025	6
1700	2400,	6			2	2x15W	1025	8
1900	2600,	6			2	2x20W	1330	8
	2800							

[More dimensions](#)



KHE-W Conventional kitchen hood

- Wall installation
- LED lighting
- Circular duct connections with regulation damper
- KCF cyclone filter
- Standard material AISI 304/EN 1.4301

Optional

- UV Ozone System
- Optional material AISI 316/EN 1.4401
- Rectangular connection



- ▼ Design principles
- ▼ Product range
- ▼ Ordering key
- ▼ Installation
- ▼ Air volume / Pressure drop
- ▼ Accessories
- ▼ Maintenance



KHE

KITCHEN VENTILATION

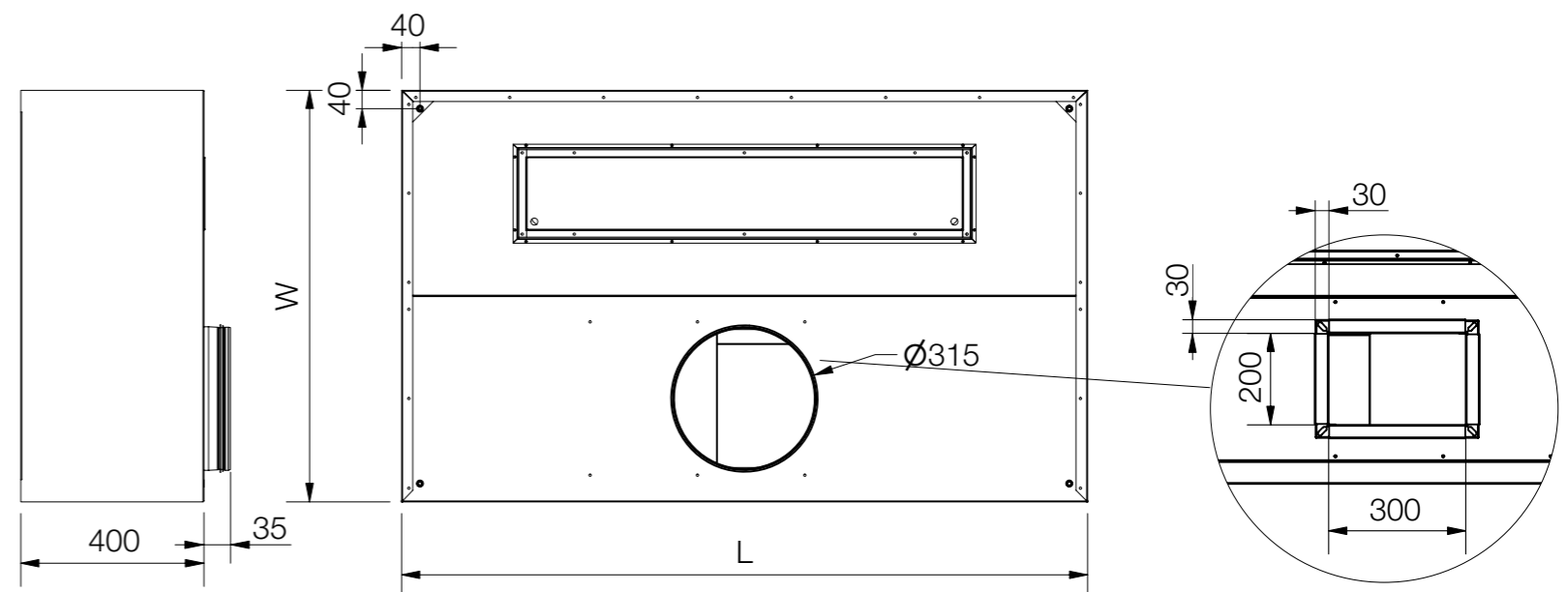
DIMENSIONS

KHE-W	Number of filters	Number of exhaust connections	Lighting LED 4000K			Suspension points
			Number of lighting fixtures	Power	Length	
L x W						
900	1	1	1	2x10W	720	4
1100	2		1		720	4
1300	2		1	2x15W	1025	4
1500	2		1		1025	4
1700	3	1	1	2x20W	1330	6
1900	3		1		1330	6
2100	4		2	1	2x25W	1630
2300	4	1		1630		8
2500	4	1		1025	8	
2700	5	2		2	2x15W	1025
2900	5		2		1025	8

[More dimensions](#)

[Circular connection details](#)

[Rectangular connection details](#)



KHE-W-A Conventional kitchen hood

- Wall installation
- Angled version
- LED lighting
- Circular duct connections with regulation damper
- KCF cyclone filter
- Standard material AISI 304/EN 1.4301

Optional

- UV Ozone System
- Optional material AISI 316/EN 1.4401
- Rectangular connection



- ▼ Design principles
- ▼ Product range
- ▼ Ordering key
- ▼ Installation
- ▼ Air volume / Pressure drop
- ▼ Accessories
- ▼ Maintenance



KHE

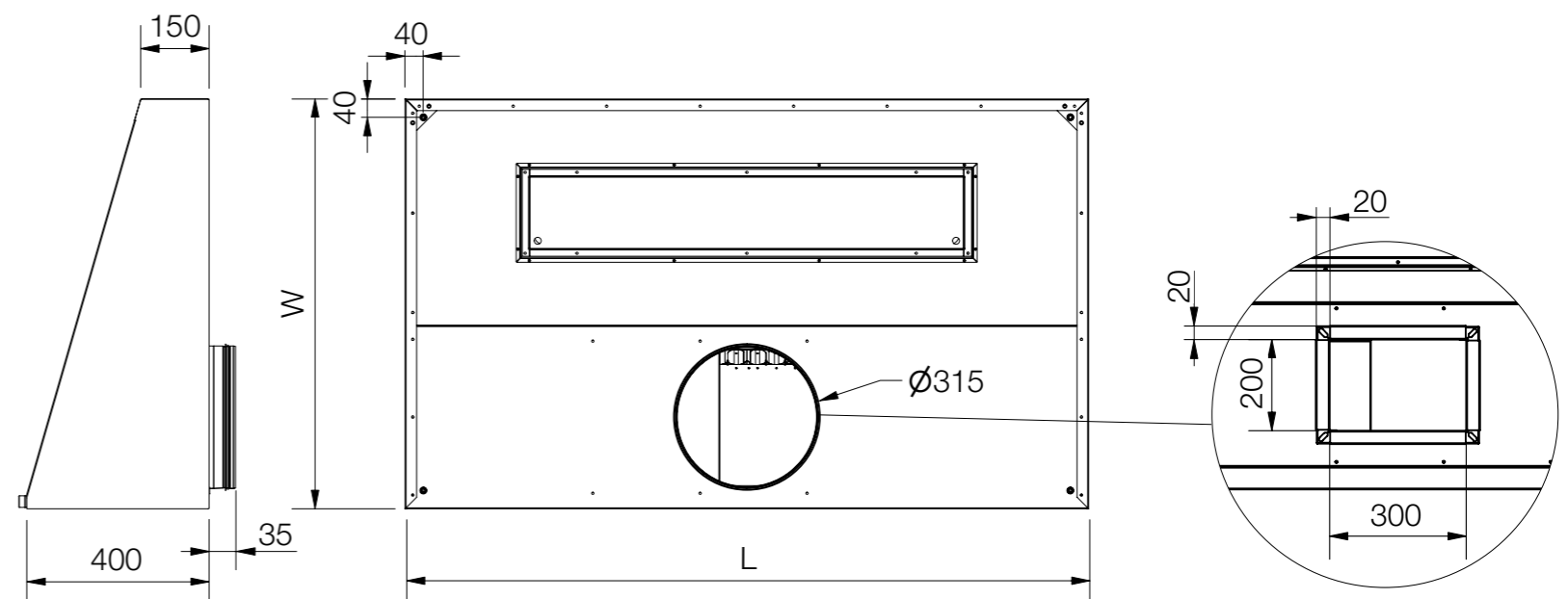
KITCHEN VENTILATION

DIMENSIONS

KHE-A	Number of filters	Number of exhaust connections	Lighting LED 4000K			Suspension points
			Number of lighting fixtures	Power	Length	
900	1	1	1	2x10W	720	4
1100	2		1		720	
1300	2		1	2x15W	1025	4
1500	2		1		1025	
1700	3		2	1	2x20W	1330
1900	3	1		1330		
2100	4	1		2x25W	1630	8
2300	4	1	1630			
2500	4	2	1	2x15W	1025	8
2700	5		2		1025	
2900	5		2	2	1025	8

Circular connection details

Rectangular connection details



KHE-S Conventional kitchen hood

- Space installation
- LED lighting
- Circular duct connections with regulation damper
- KCF cyclone filter
- Standard material AISI 304/EN 1.4301

Optional

- UV Ozone System
- Optional material AISI 316/EN 1.4401
- Rectangular connection



- ▼ Design principles
- ▼ Product range
- ▼ Ordering key
- ▼ Installation
- ▼ Air volume / Pressure drop
- ▼ Accessories
- ▼ Maintenance



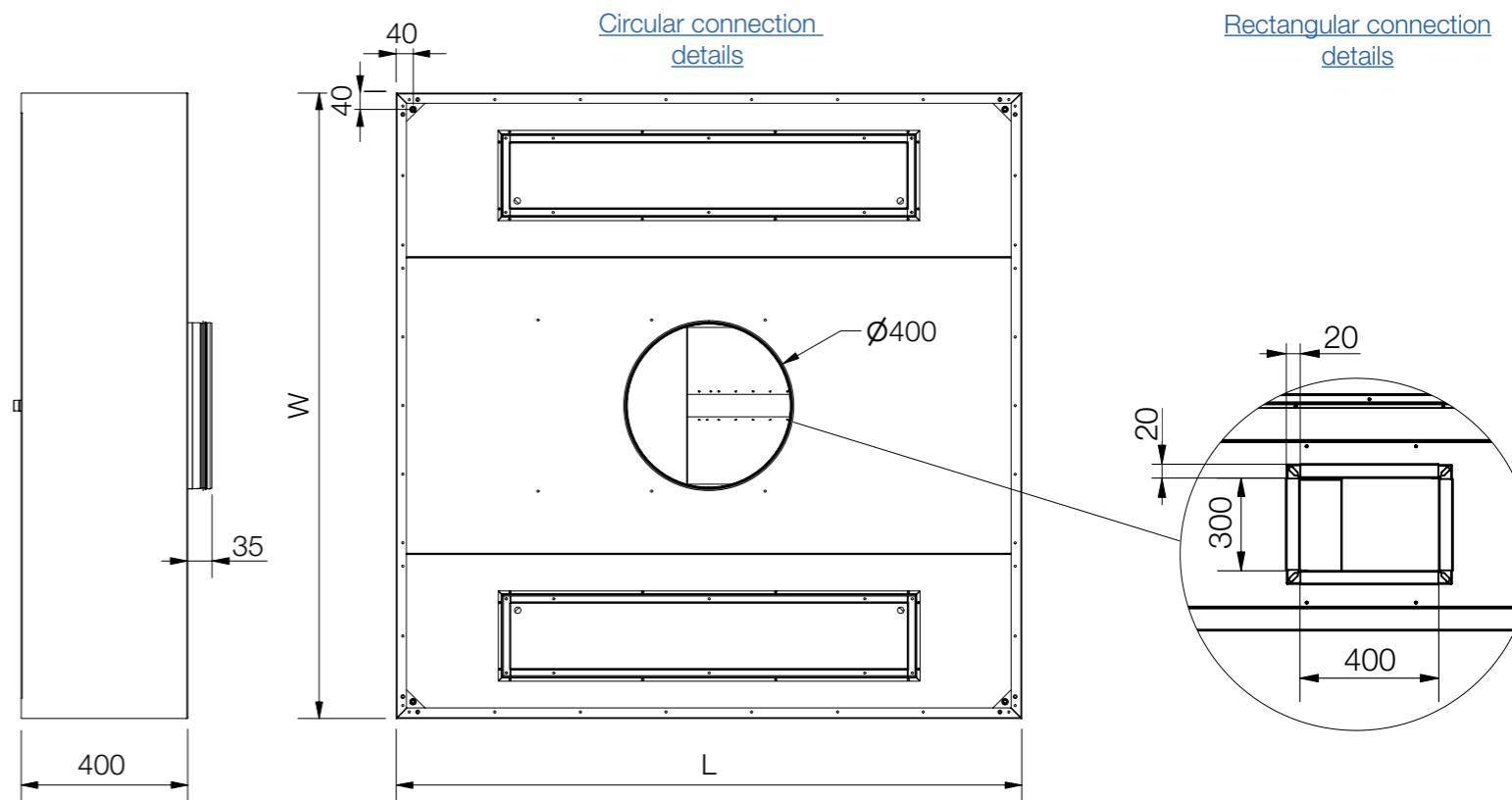
KHE

KITCHEN VENTILATION

DIMENSIONS

KHE-S	Number of filters	Number of exhaust connections	Lighting LED 4000K			Suspension points
			Number of lighting fixtures	Power	Length	
L x W						
900	2	1	2	2x10W	720	6
1100	4		2		720	6
1300	4		2		1025	6
1500	4		2	1025	6	
1700	6		2x20W	2	1330	8
1900	6			2	1330	8
2100	8	2	2	2x25W	1630	8
2300	8		2		1630	10
2500	8		4	1025	10	
2700	10		4	2x15W	1025	10
2900	10	4	4	1025	10	

[More dimensions](#)

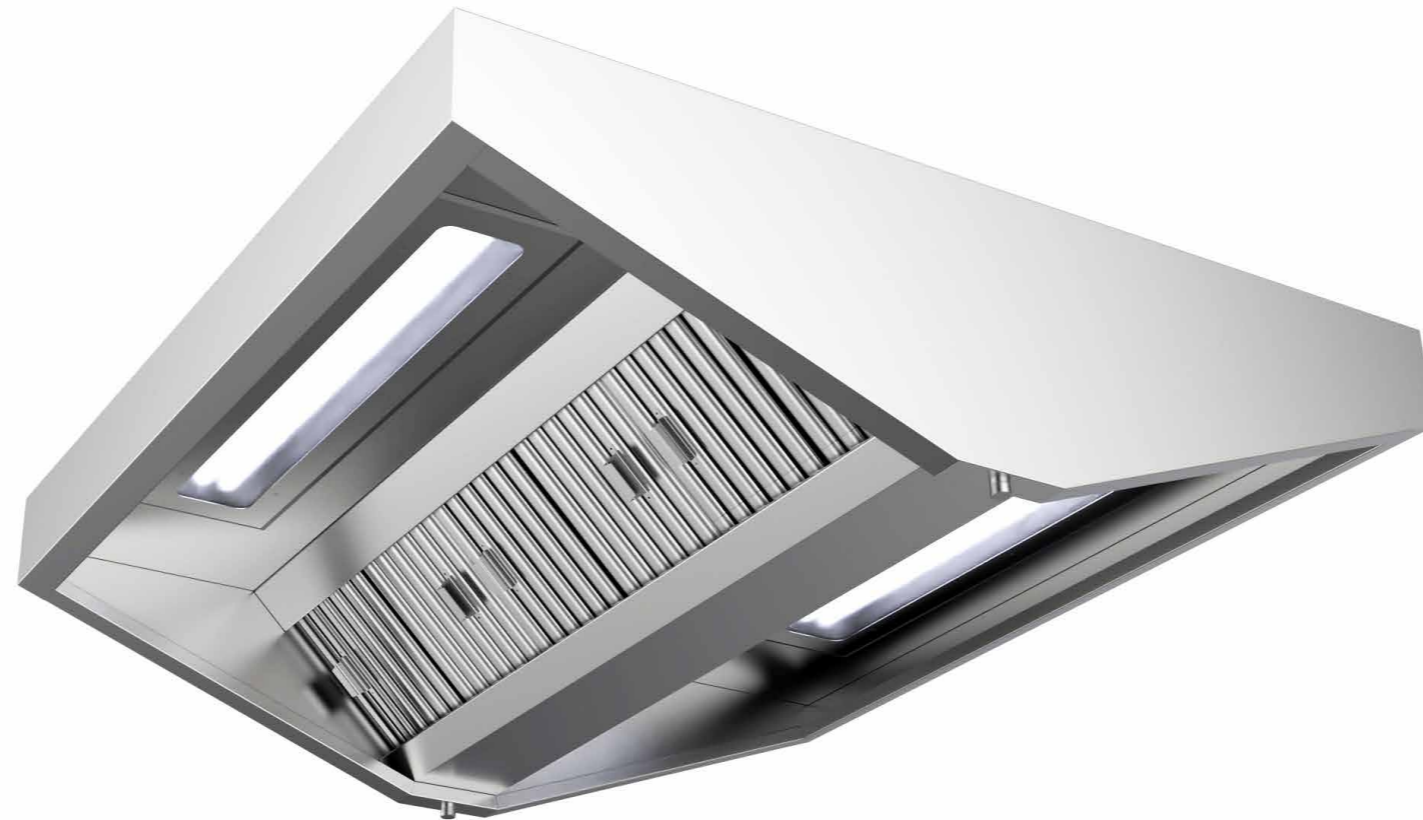


KHE-S-A Conventional kitchen hood

- Space installation
- Angled version
- LED lighting
- Circular duct connections with regulation damper
- KCF cyclone filter
- Standard material AISI 304/EN 1.4301

Optional

- UV Ozone System
- Optional material AISI 316/EN 1.4401
- Rectangular connection



- ▼ Design principles
- ▼ Product range
- ▼ Ordering key
- ▼ Installation
- ▼ Air volume / Pressure drop
- ▼ Accessories
- ▼ Maintenance

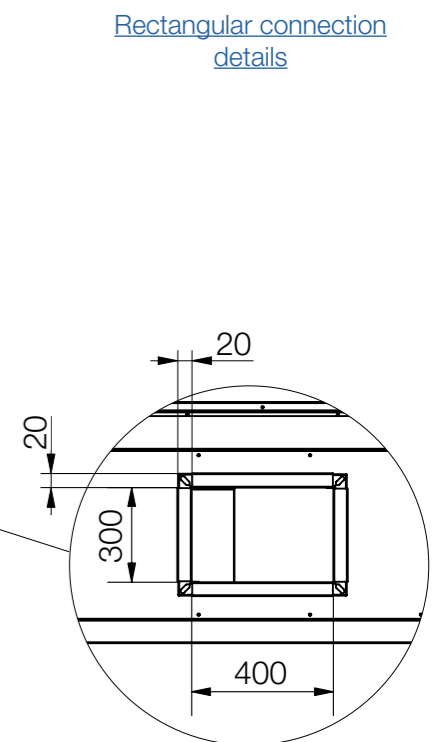
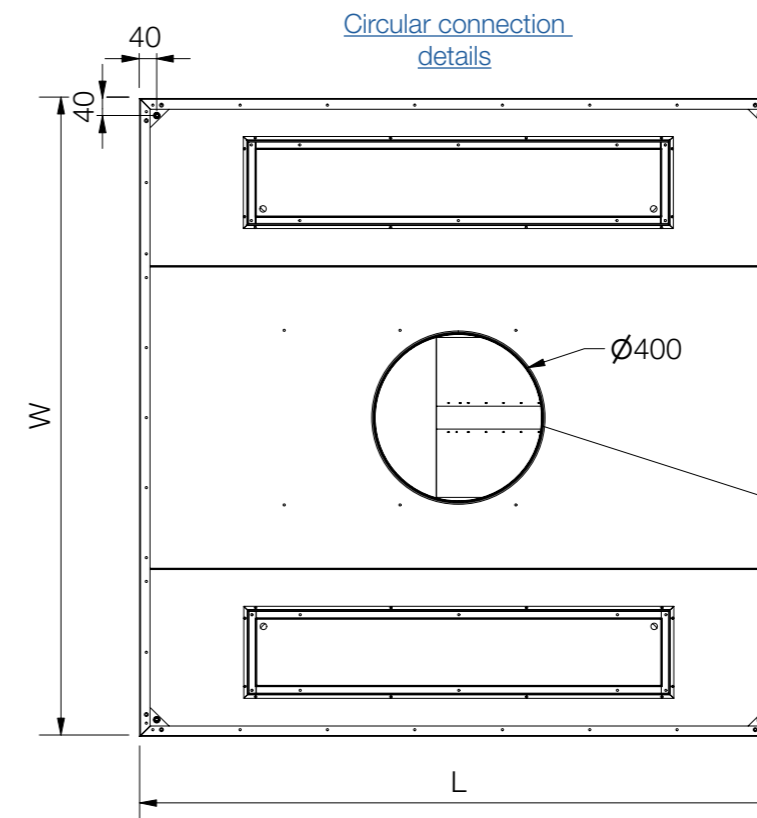
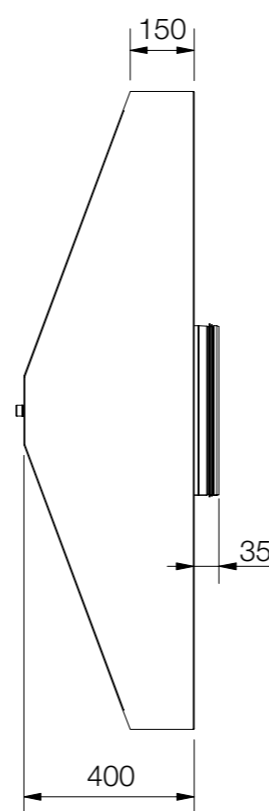


KHE

KITCHEN VENTILATION

DIMENSIONS

KHE-S-A	Number of filters	Number of exhaust connections	Lighting LED 4000K			Suspension points
			Number of lighting fixtures	Power	Length	
L x W						
900	2	1	2	2x10W	720	6
1100	4		2		720	6
1300	4		2		1025	6
1500	4		2	1025	6	
1700	6		2x20W	2	1330	8
1900	6			2	1330	8
2100	8	2	2	2x25W	1630	8
2300	8		2		1630	10
2500	8		4	1025	10	
2700	10		4	2x15W	1025	10
2900	10	4	4	1025	10	



KHC-W Condensation exhaust hood

- Wall installation
- LED lighting
- Circular duct connections with regulation damper
- Standard material AISI 304/EN 1.4301

Optional

- Optional material AISI 316/EN 1.4401
- Rectangular connection



- ▼ Design principles
- ▼ Product range
- ▼ Ordering key
- ▼ Installation
- ▼ Air volume / Pressure drop
- ▼ Accessories
- ▼ Maintenance

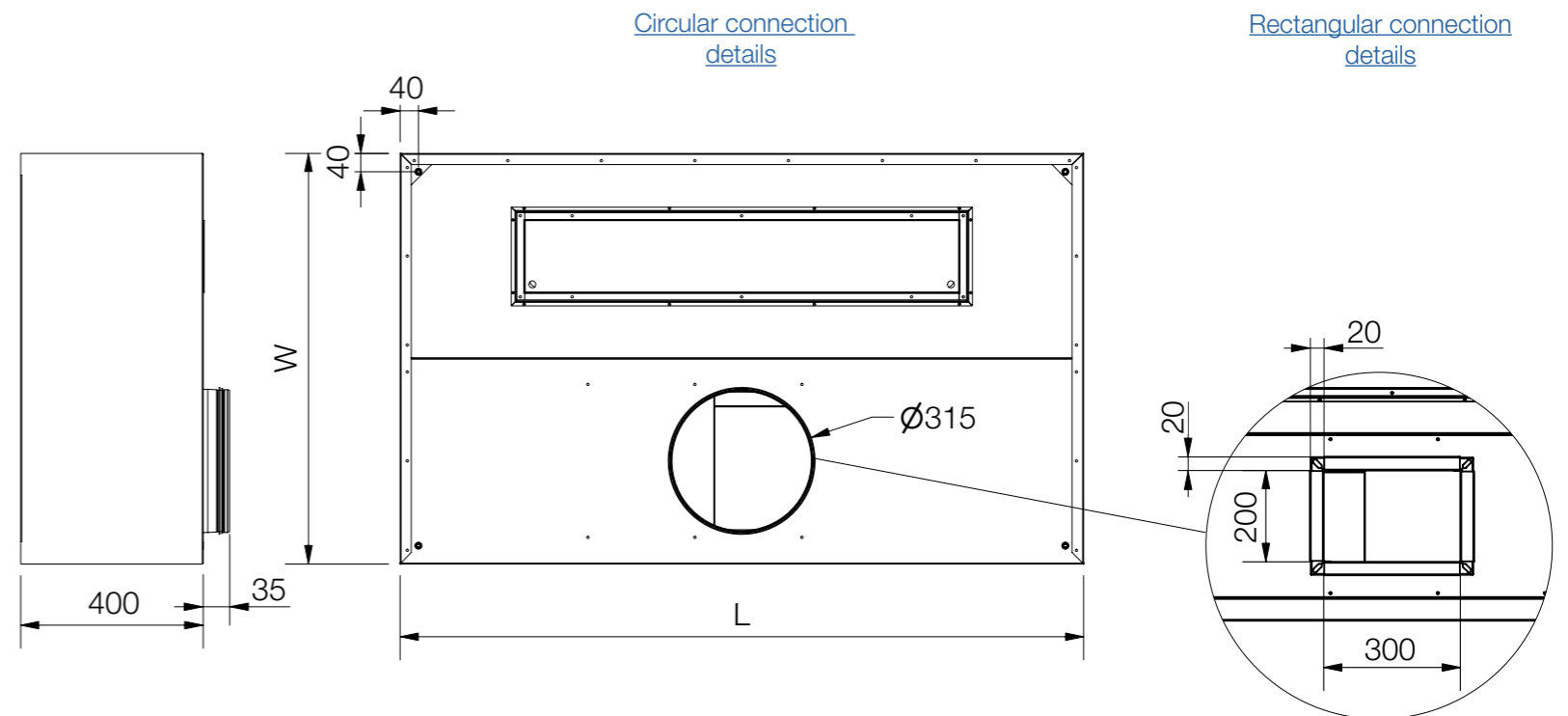


KHC

KITCHEN VENTILATION

DIMENSIONS

KHC-W	Number of exhaust connections	Lighting LED 4000K			Suspension points
		Number of lighting fixtures	Power	Length	
900	1	1	2x10W	720	4
1100		1		720	
1300		1	2x15W	1025	4
1500		1		1025	
1700		2	1	2x20W	1330
1900	1		1330		
2100	1		2x25W	1630	6
2300	1	1630		8	



Hood sections combinations

	L x W	1100	1300	1500
	1100			
	1300			
	1500			
	1700			
	1900			
	2100			
	2300			
	2500			
	2700			
	2900			
KHI-W	3300	2 x 1700	2 x 1700	2 x 1700
	3700	2 x 1900	2 x 1900	2 x 1900
	4100	2 x 2100	2 x 2100	2 x 2100
	4500	2 x 2300	2 x 2300	2 x 2300
	4900	2 x 2500	2 x 2500	2 x 2500
	5300	2 x 2700	2 x 2700	2 x 2700
	5700	2 x 2900	2 x 2900	2 x 2900
	6100	3 x 2100	3 x 2100	3 x 2100

- KHI-W x 1
- KHI-W x 2
- KHI-W x 3

	L x W	1800	2000	2200	2400	2600	2800
	1100						
	1300						
	1500						
	1700						
	1900						
KHI-S	2100	2x1100	2x1100	2x1100	2x1100	2x1100	2x1100
	2500	2x1300	2x1300	2x1300	2x1300	2x1300	2x1300
	2900	2x1500	2x1500	2x1500	2x1500	2x1500	2x1500
	3300	2x1700	2x1700	2x1700	2x1700	2x1700	2x1700
	3700	3x1300	3x1300	3x1300	3x1300	3x1300	3x1300
	4300	3x1500	3x1500	3x1500	3x1500	3x1500	3x1500
	4900	3x1700	3x1700	3x1700	3x1700	3x1700	3x1700
	5500	3x1900	3x1900	3x1900	3x1900	3x1900	3x1900
	5700	4x1500	4x1500	4x1500	4x1500	4x1500	4x1500
	6500	4x1700	4x1700	4x1700	4x1700	4x1700	4x1700

- KHI-S x 1
- KHI-S x 2
- KHI-S x 3
- KHI-S x 4

- Design principles
- Product range
- Ordering key
- Installation
- Air volume / Pressure drop
- Accessories
- Maintenance

PRODUCT RANGE






For more information about pressure drops visit [Klimaoprema selection software](#)

Hood sections combinations





L x W	900	1100	1300	1500
900				
1100				
1300				
1500				
1700				
1900				
2100				
2300				
2500				
2700				
2900				
3400	2x1700	2x1700	2x1700	2x1700
3800	2x1900	2x1900	2x1900	2x1900
4200	2x2100	2x2100	2x2100	2x2100
4600	2x2300	2x2300	2x2300	2x2300
5000	2x2500	2x2500	2x2500	2x2500
5400	2x2700	2x2700	2x2700	2x2700
5800	2x2900	2x2900	2x2900	2x2900
6300	3x2100	3x2100	3x2100	3x2100








KHE-W

-  KHE-W x 1
-  KHE-W x 2
-  KHE-W x 3

L x W	1400	1600	1800	2000	2200	2400
900						
1100						
1300						
1500						
1700						
1900						
2100				2x 1100	2x 1100	2x 1100
2300				2x 1200	2x 1200	2x 1200
2500				2x 1300	2x 1300	2x 1300
2700				2x 1400	2x 1400	2x 1400
2900				2x 1500	2x 1500	2x 1500
3400	2x1700	2x1700	2x1700	2x1700	2x1700	2x1700
3900	3x1300	3x1300	3x1300	3x1300	3x1300	3x1300
4500	3x1500	3x1500	3x1500	3x1500	3x1500	3x1500
5100	3x1700	3x1700	3x1700	3x1700	3x1700	3x1700
5700	3x1900	3x1900	3x1900	3x1900	3x1900	3x1900
6000	4x1500	4x1500	4x1500	4x1500	4x1500	4x1500

KHE-S

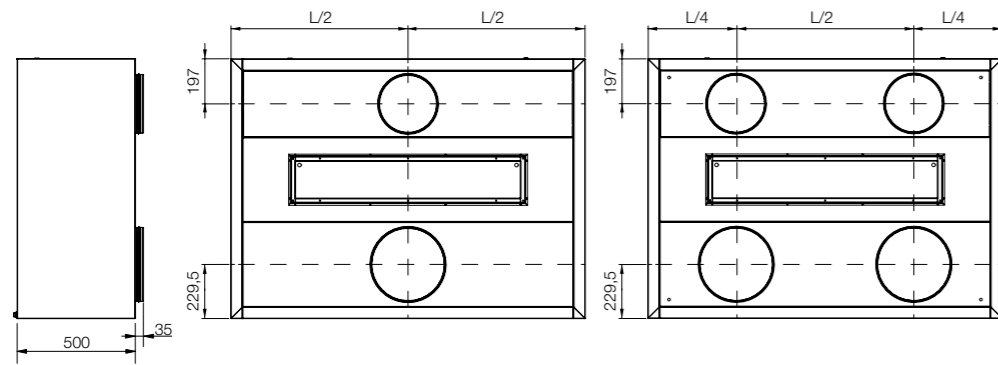
-  KHE-S x 1
-  KHE-S x 2
-  KHE-S x 3
-  KHI-S x 4

-  Design principles
-  Product range
-  Ordering key
-  Installation
-  Air volume / Pressure drop
-  Accessories
-  Maintenance

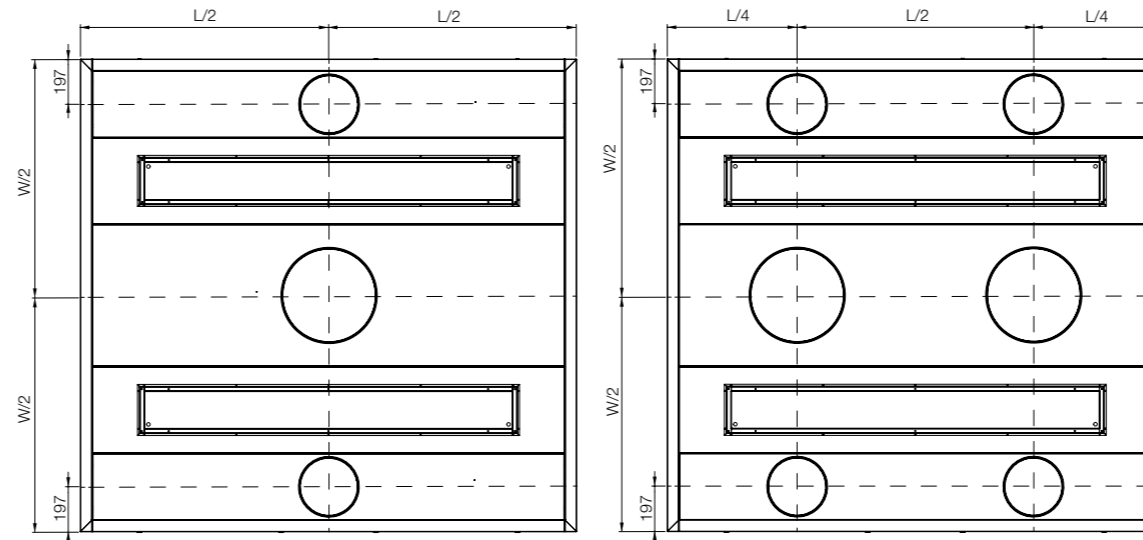
 **PRODUCT RANGE**

Air duct circular connection positions

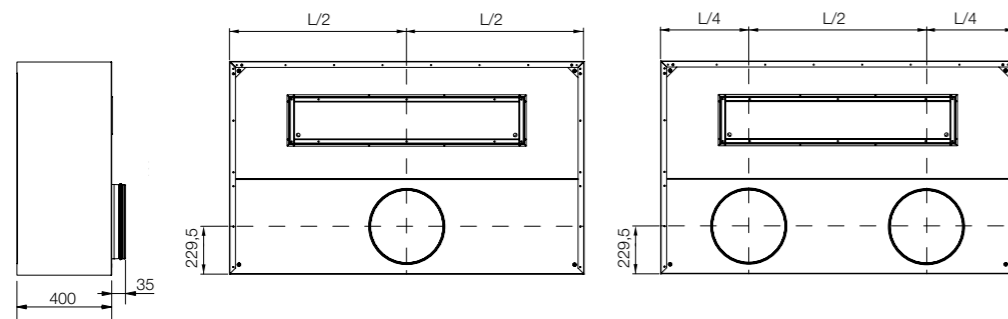
KHI



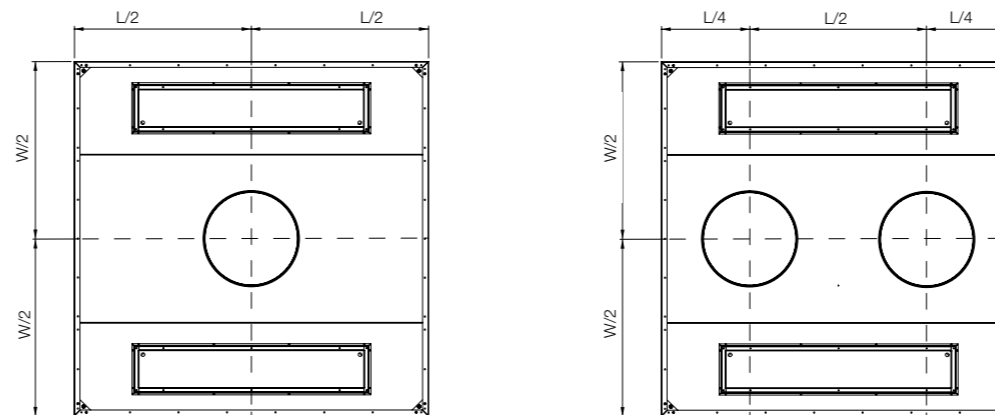
KHI-S



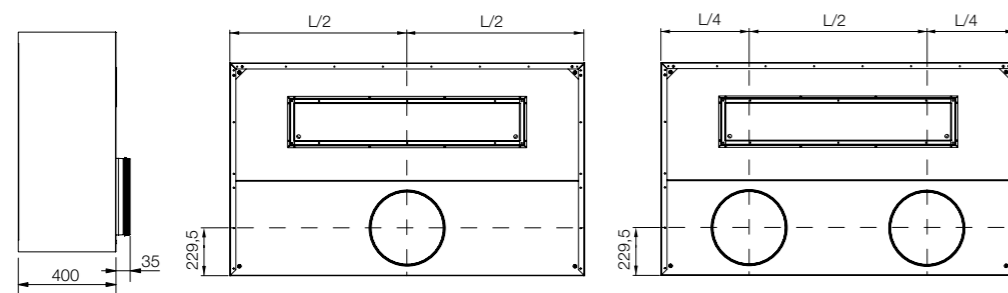
KHE



KHE-S



KHC

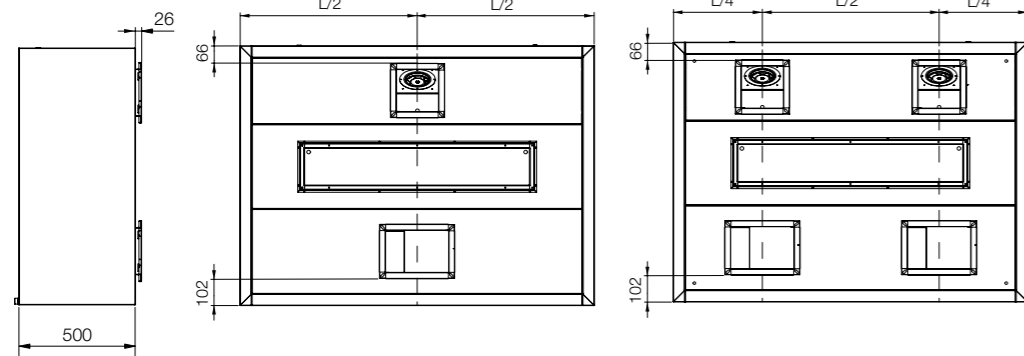


- ▼ Design principles
- ▼ Product range
- ▼ Ordering key
- ▼ Installation
- ▼ Air volume / Pressure drop
- ▼ Accessories
- ▼ Maintenance

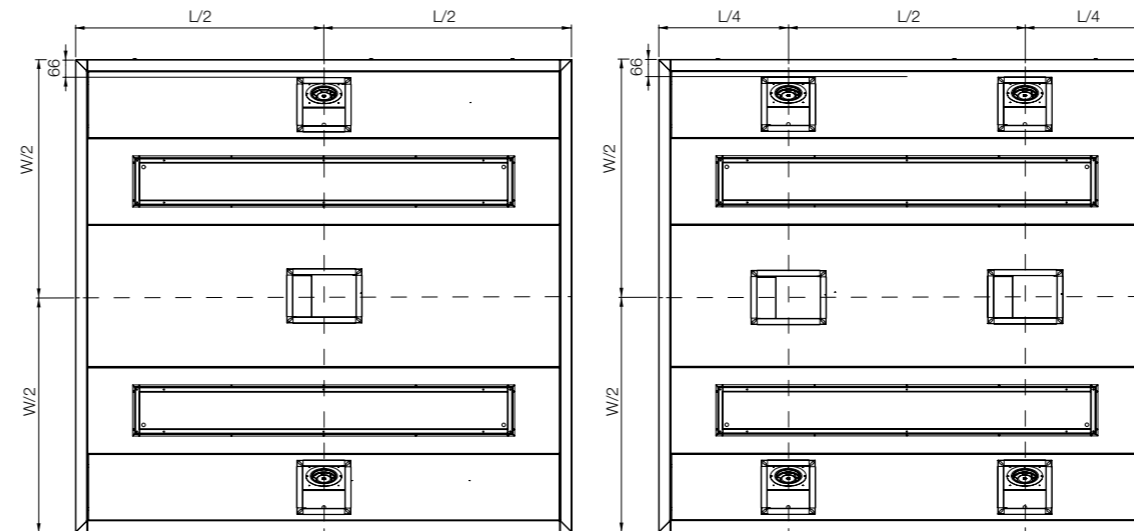
 **PRODUCT RANGE**

Air duct rectangular connection positions

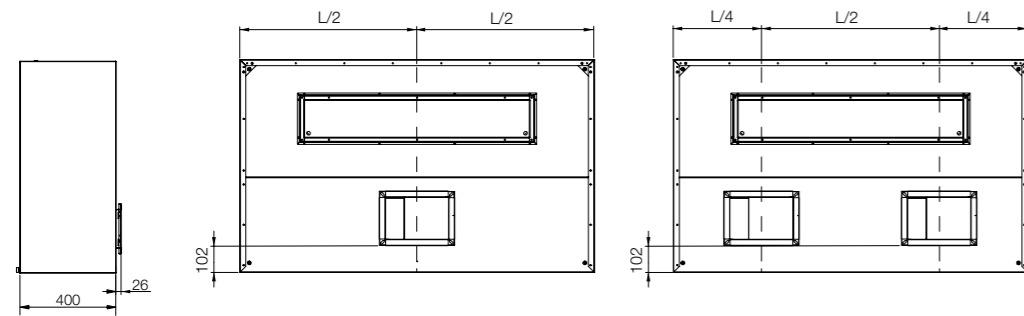
KHI



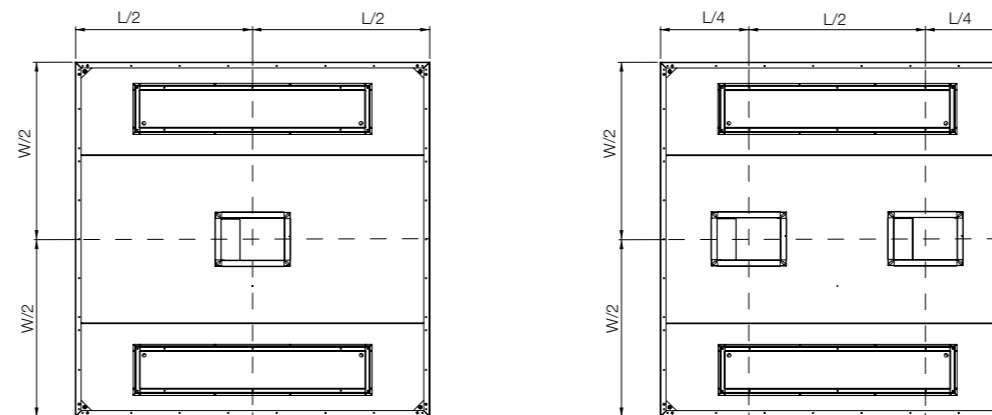
KHI-S



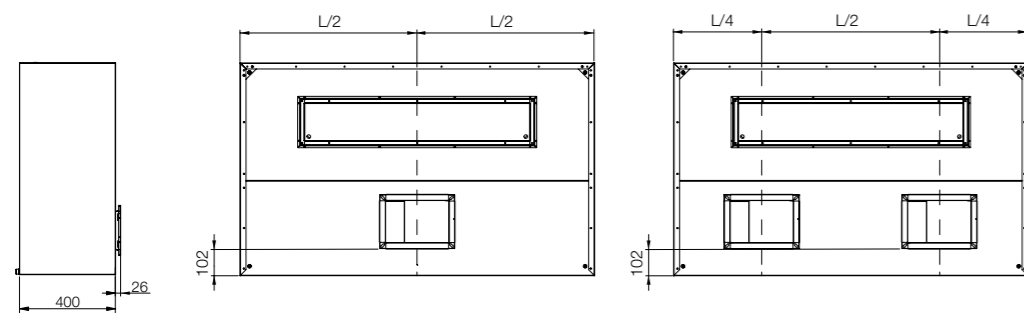
KHE



KHE-S

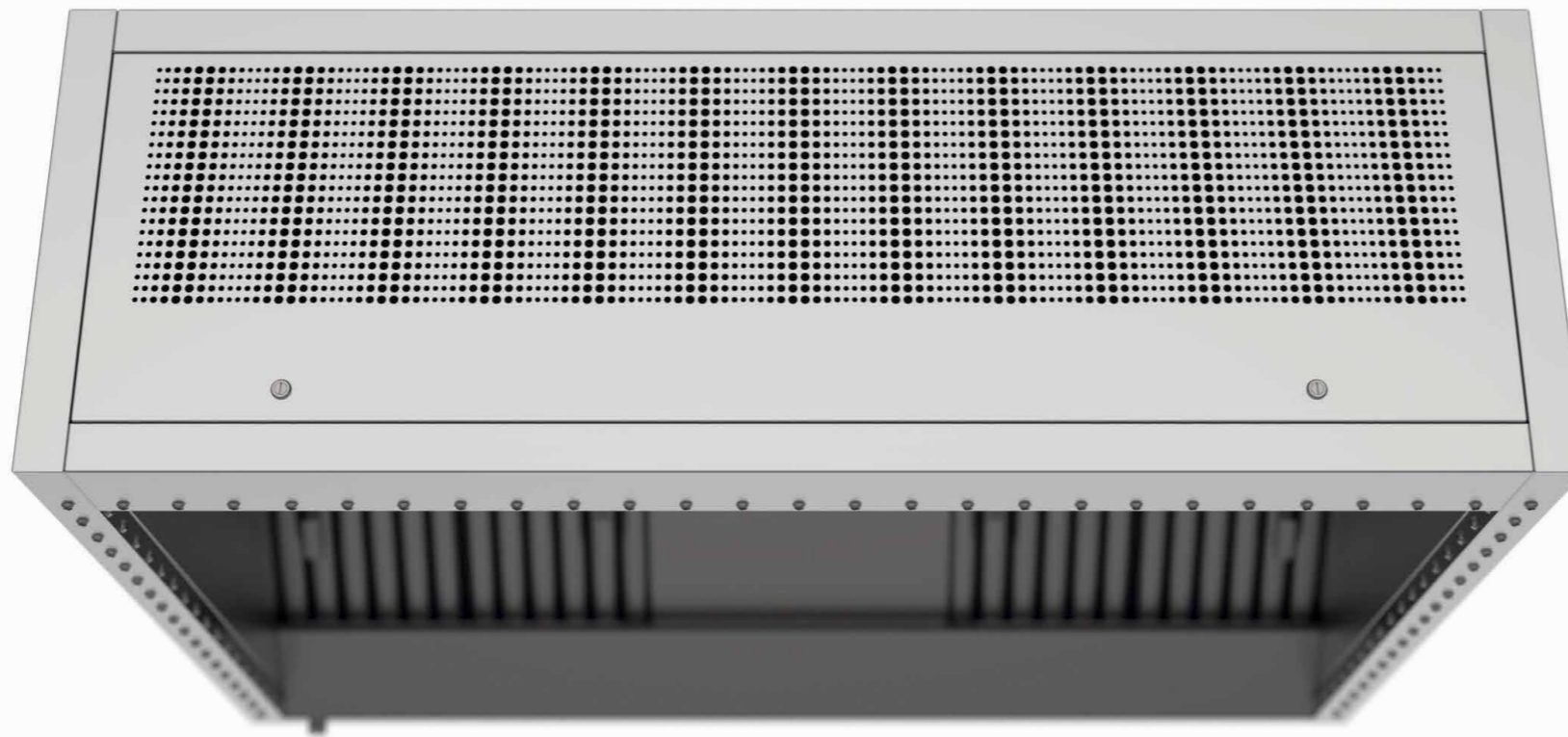


KHC



- ▼ Design principles
- ▼ Product range
- ▼ Ordering key
- ▼ Installation
- ▼ Air volume / Pressure drop
- ▼ Accessories
- ▼ Maintenance

 **PRODUCT RANGE**



- ▼ Design principles
- ▼ Product range
- ▼ Ordering key
- ▼ Installation
- ▼ Air volume / Pressure drop
- ▼ Accessories
- ▼ Maintenance



ORDERING KEY

KITCHEN VENTILATION

ORDERING KEY (1) Hood (2) Installation (3) Options (4) Dimensions (5) Connection type (6) Material

KHI - W - F - 2500 x 1100 x 500 - P - 316

- | | |
|---|---|
| <p>(1) KHE
KHI
KHC</p> <p>(2) Installation
W- wall installation
S- Ceiling installation (optional on KHI/KHE)</p> <p>(3) F- Fresh air supply (optional on KHI)
A- Angled version (optional on KHE)</p> | <p>(4) Dimensions L x W x H</p> <p>(5) Connection type
P- Rectangular connection
C- Circular connection</p> <p>(6) Material
Optional - 316 - AISI 316/EN 1.4401</p> |
|---|---|

* For more technical information visit www.klimaoprema.com

FILTER ORDERING KEY (1) KCF Filter (2) Material

KCF - 316

- (1) **KCF**
- (2) Material
Optional - **316** - AISI 316/EN 1.4401

BLANK FILTER ORDERING KEY (1) KCF Filter (2) Material

KCF-B - 316

- (1) **KCF-B**
- (2) Material
Optional - **316** - AISI 316/EN 1.4401

Installation

Suspension installation procedure

1. Drill holes in ceiling and put anchors in it
2. Place open hooks into ceiling anchors
3. Place hooks into riv-nuts in hood ceiling
4. Place hooks into tensioner
5. Place cable into the hook

Gripple suspension system

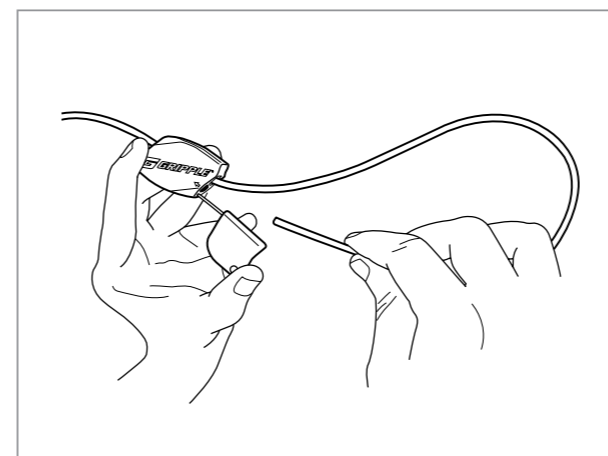
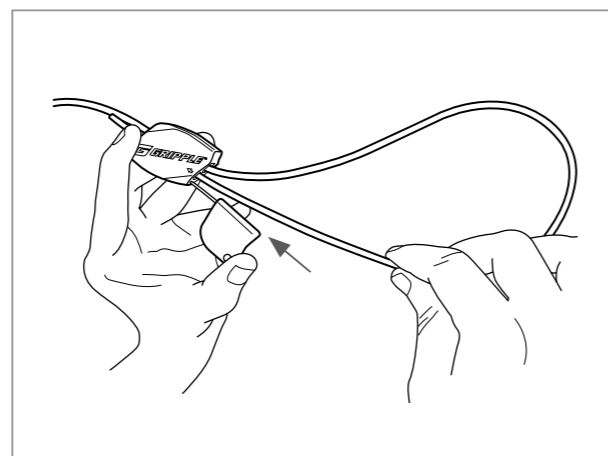
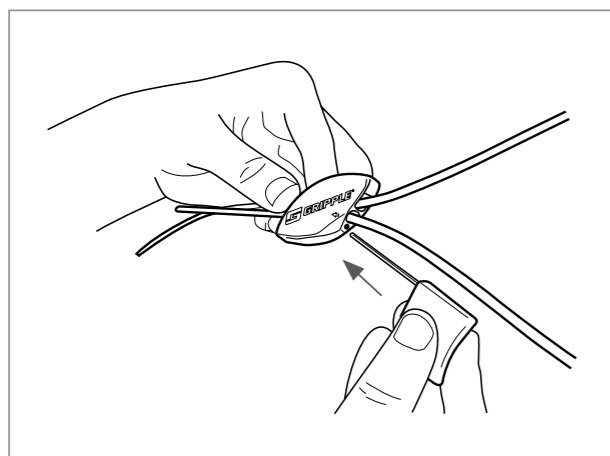
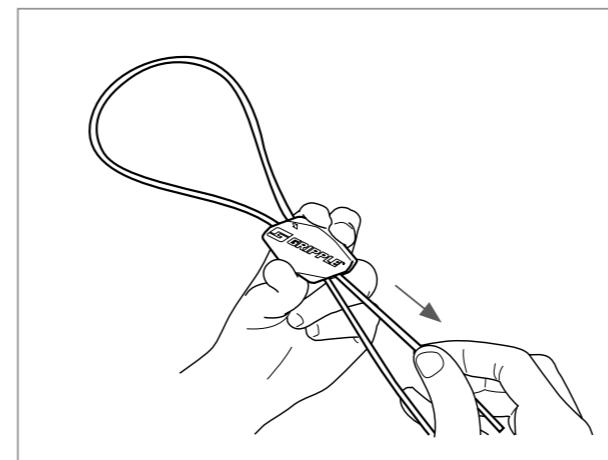
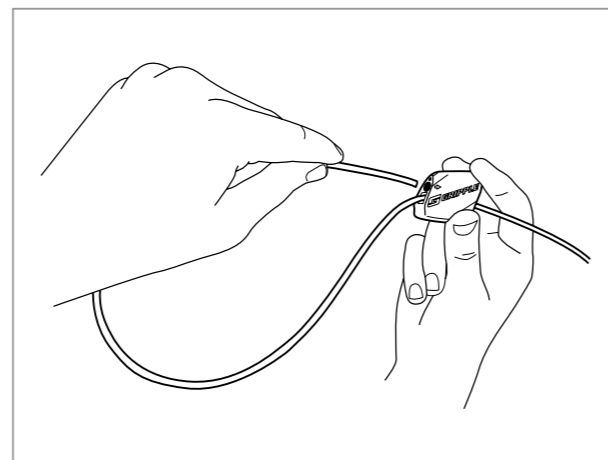
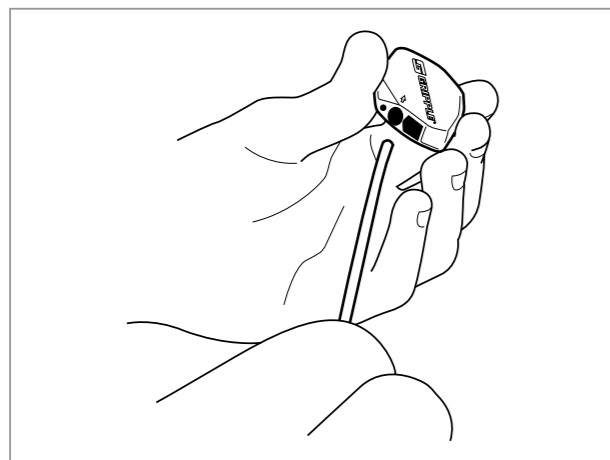
Used to suspend a variety of HVAC, mechanical and electrical services from different substrates. Ideal for fast suspension of cable containment, pipework, air conditioning

- Up to six times faster to install than traditional hanging systems
- Versatile and simple to use
- Strong, safe and industry approved
- Aesthetically discreet and lightweight
- Supplied in ready-to-use kits, comprising a length of wire, pre-crimped End Fixing, Gripple Hanger and Setting Key

For more information visit www.gripple.com



- ▼ Design principles
- ▼ Product range
- ▼ Ordering key
- ▼ Installation
- ▼ Air volume / Pressure drop
- ▼ Accessories
- ▼ Maintenance



*Ensure a minimum 75 mm of tail wire exits the hanger.

INSTALLATION

* Kitchen hood weight can be up to 200kg. It is instructed to use lifting platform when installing the hood. Hood should be placed to a height of 2,1m from the floor.

Installation

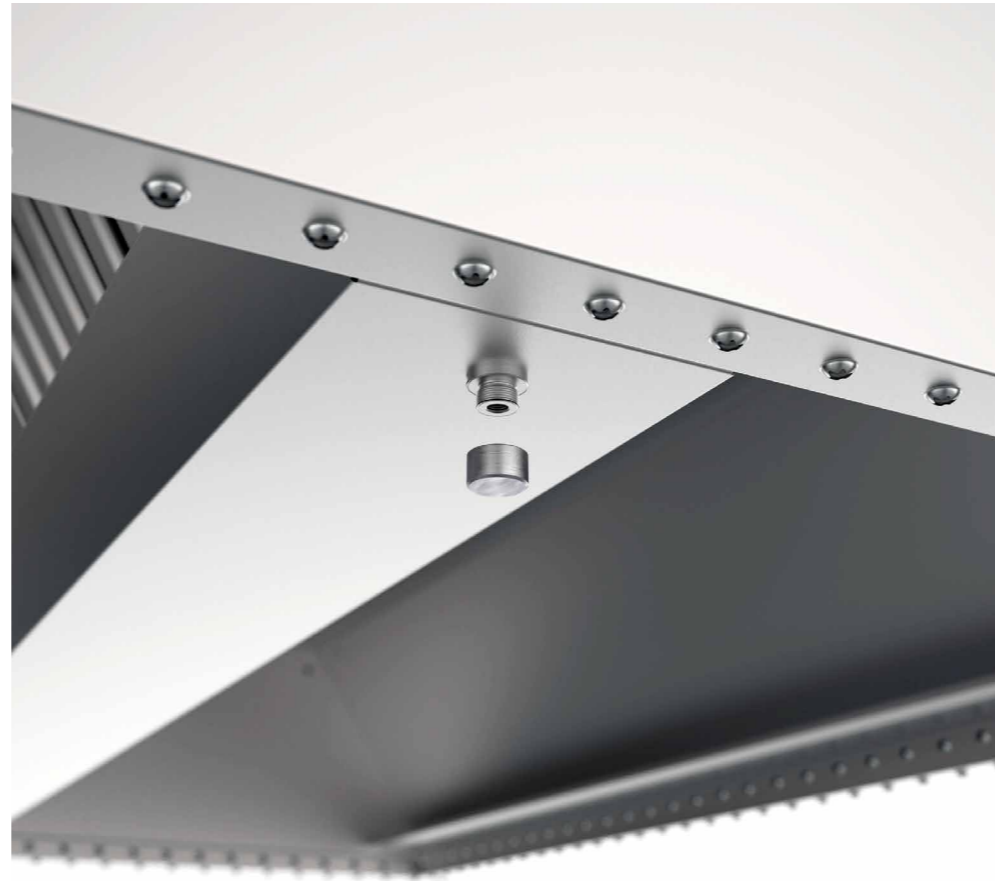
Condensate drain

Condensate draining is done by unscrewing the threaded cap on the bottom of the hood. First few weeks condensate should be checked on a daily basis to determine cleaning interval. If condensate is concentrated on the other side of the hood should be leveled accordingly. Thread on the cap is G3/8".

Connecting of multiple part hood

Multiple part hoods are delivered with a connecting angle. Adjust the hood so that holes are coincident with holes in the other half of the hood and fasten it with rivets.

If the hood is made out of multiple parts, every part has its own suspension anchors. After lifting all parts are fastened mutually with nuts and bolts M8. When parts are fastened, check that all joining edges are linear. If insulation in supply chamber is damaged during installation, seal the damage before starting to use the hood. Hood is standardly delivered with supply and exhaust connections. Dimensions depend on the size of the hood and can be found in technical catalogue (5/S1). Connection height is standard 100 mm or 125 mm if equipped with aluminium regulation louver. Sealing silicone should be placed on hood-connection-duct connections. Hood ceiling and duct connection can be fastened with sheet metal screws or nuts and bolts. Duct connection can be fastened with sheet metal screws, nuts and bolts, rivets or duct couplings. Check that mounting points and ductwork position is in accordance with expected position of the hood.



- ▼ Design principles
- ▼ Product range
- ▼ Ordering key
- ▼ Installation
- ▼ Air volume / Pressure drop
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Installation

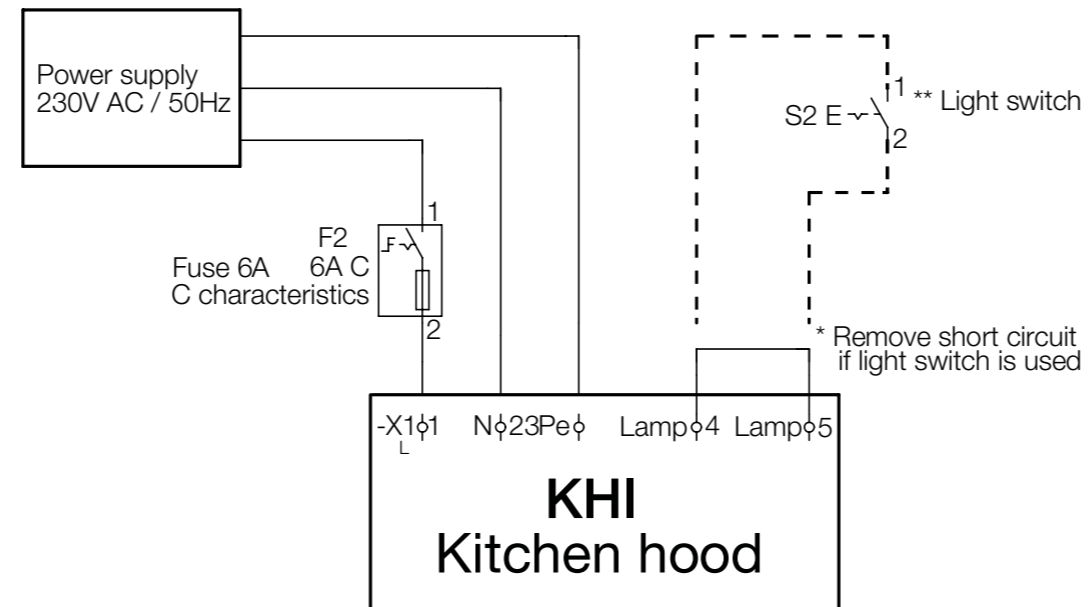
Wiring diagram - KHI



*Danger from electric current

In case of insulation damage, shut down the power supply immediately.

- Only qualified personnel can work on electrical system of the hood
- Before working on electrical system check that system is not under current
- Never disable or short circuit electric fuse.
- Check system current after changing the fuse.
- Electronics should not be working in damp conditions, it can cause short circuit.
- Install shortest possible cable route
- Prevent damage from sharp edges



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INSTALLATION

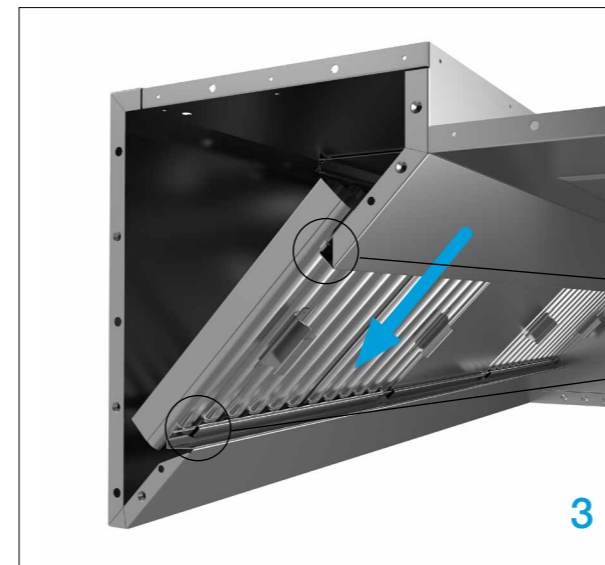
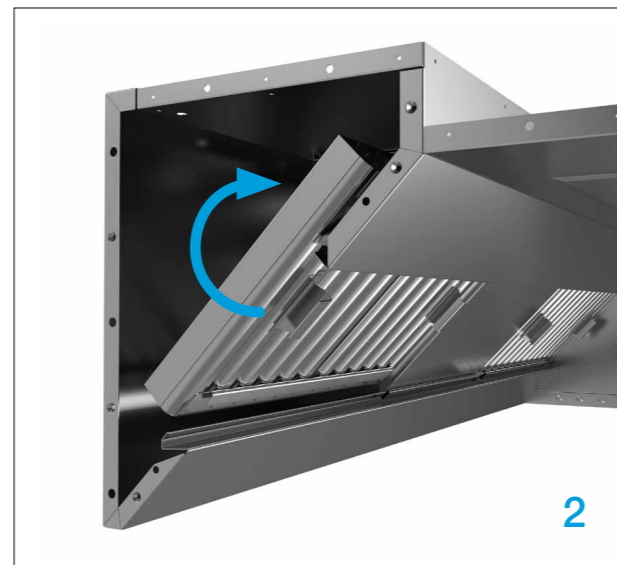
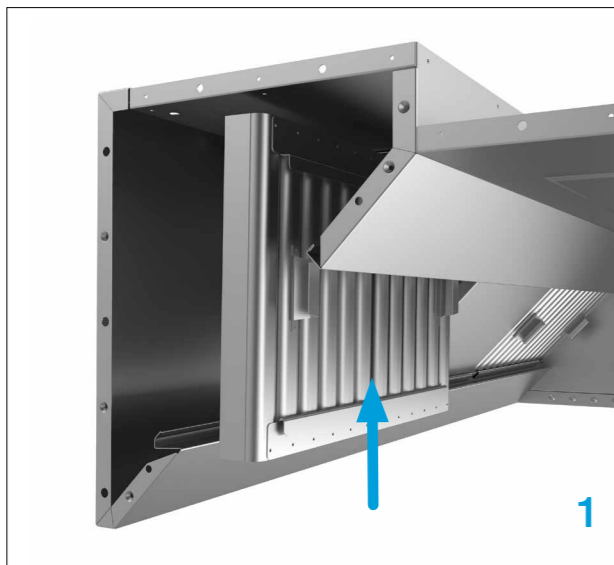
Installation

Cyclone filters

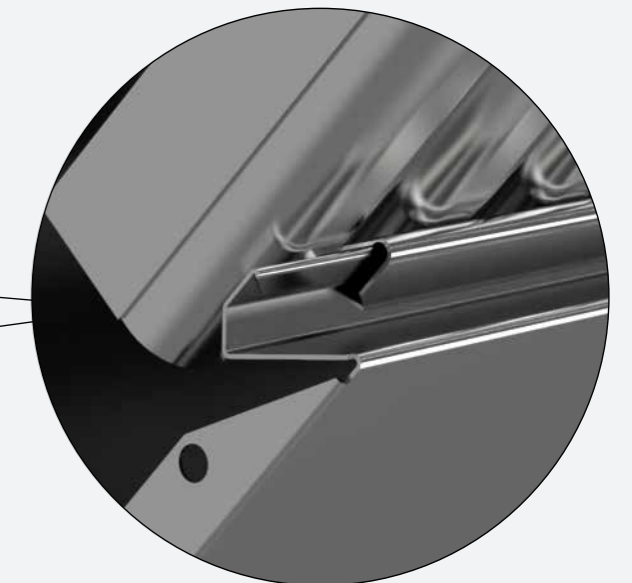
Cleaning intervals is determined for each kitchen individually. Filter should be washed with hot water and detergent or washed in dishwashing machine. KCF filter can be disassembled in a manner showed on lower drawings. Manufacturer Klimaoprema d.d. doesn't take any responsibility for damage done by clogged or dirty filters.

Inserting cyclone filter

1. Place filter to inner side of the hood
2. Place filter into upper rail
3. Lower the filter into lower rail



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Installation

Lighting

Body is electro-galvanized finished in RAL 9010 white paint with tempered glass, thickness 4 mm, IP55 ingress protection. Cover is AISI 304 SB stainless steel.

Features

- Anti-drop cable with clip and shackle
- Lighting assembly consisting of white painted sheet steel envelope, thickness 0.5 mm, 2 x SYLVANIA Luxline Plus lamps, A2 class power supply, HN H- 1x 220/240V reactor, G5 tube holder
- Power cord: cord with silicone sheath for resistance to high temperatures, length 1.5 m

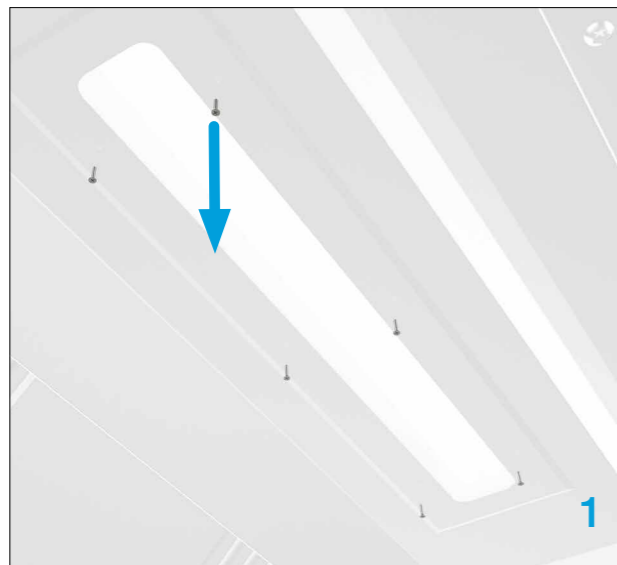
Changing LED tubes

1. Locate and remove 6 screws
2. Remove the cover and let it hang on the safety cable.
3. Disconnect LED tubes by rotating them



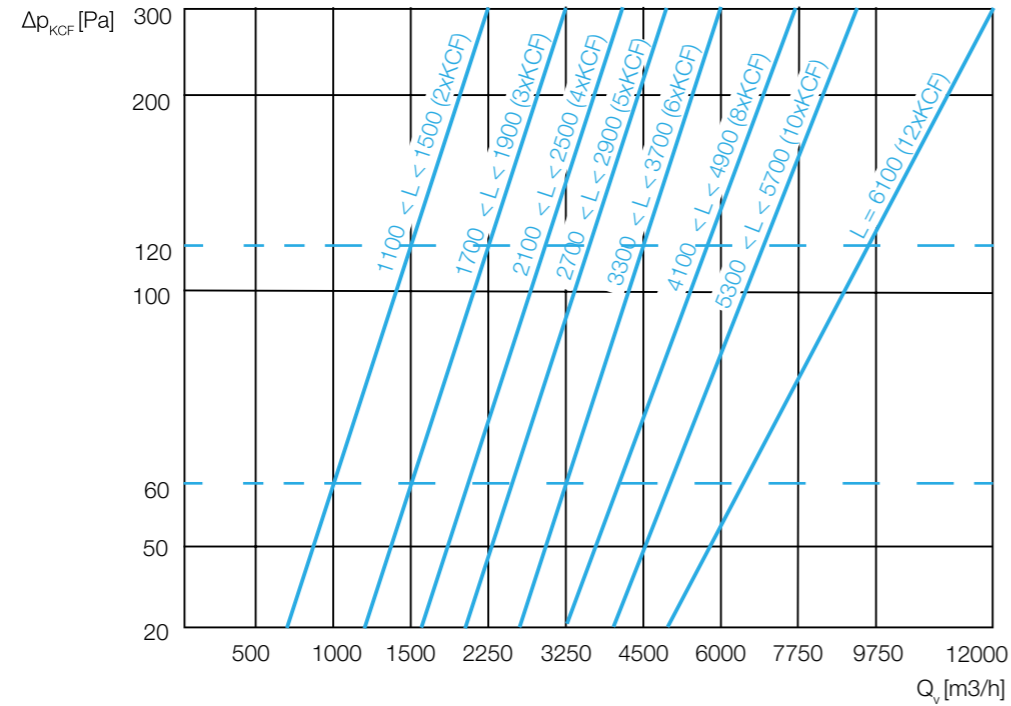
- ▼ Design principles
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 INSTALLATION



Air volume and pressure drop tables

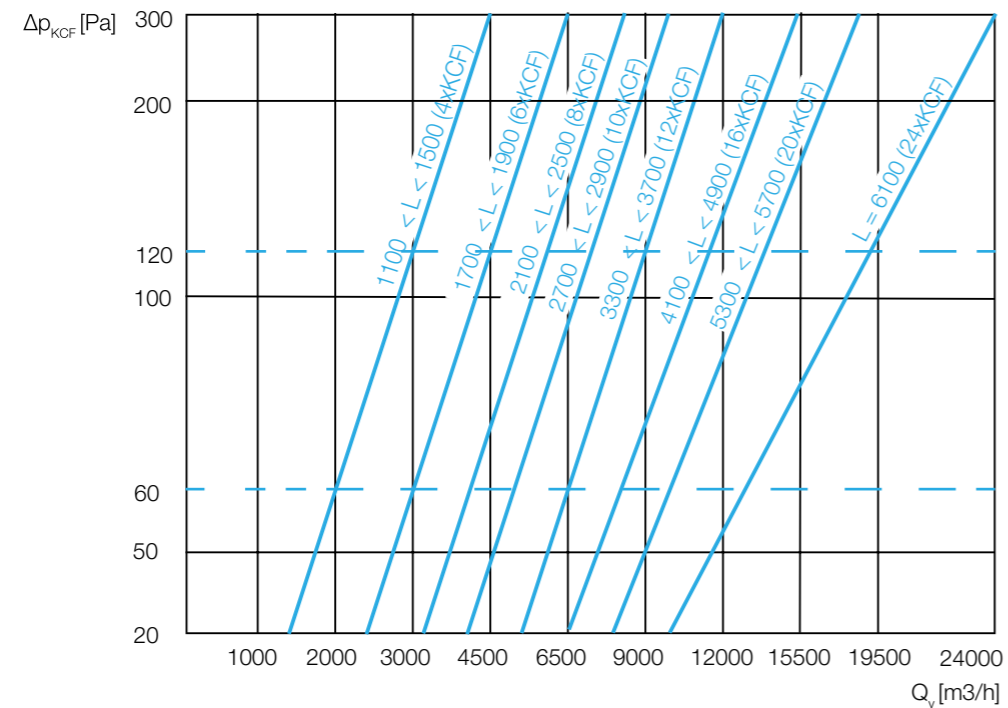
Exhaust volume per wall kitchen hood length L[mm]:
Recommended filter operating pressures 60 - 120Pa



Maximum recommended airflow

Minimum recommended airflow

Exhaust volume per ceiling kitchen hood length L[mm]:
Recommended filter operating pressures 60 - 120Pa



Maximum recommended airflow

Minimum recommended airflow

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PRESSURE DROP



For more information about pressure drops visit [Klimaoprema selection software](#)

Accessories

UV ozone purification system

High performance vacuum UV lamps filled with amalgam remain extremely effective even at ambient temperatures up to 80 ° C. The long service life of one UV lamp, up to 10,000 operating hours, minimizes the number of services required, and the efficiency of the system reduces the need for dry cleaning of the exhaust system professional kitchens.

The most important advantages of installing the UVC Ozone system of the company Klimaoprema are:

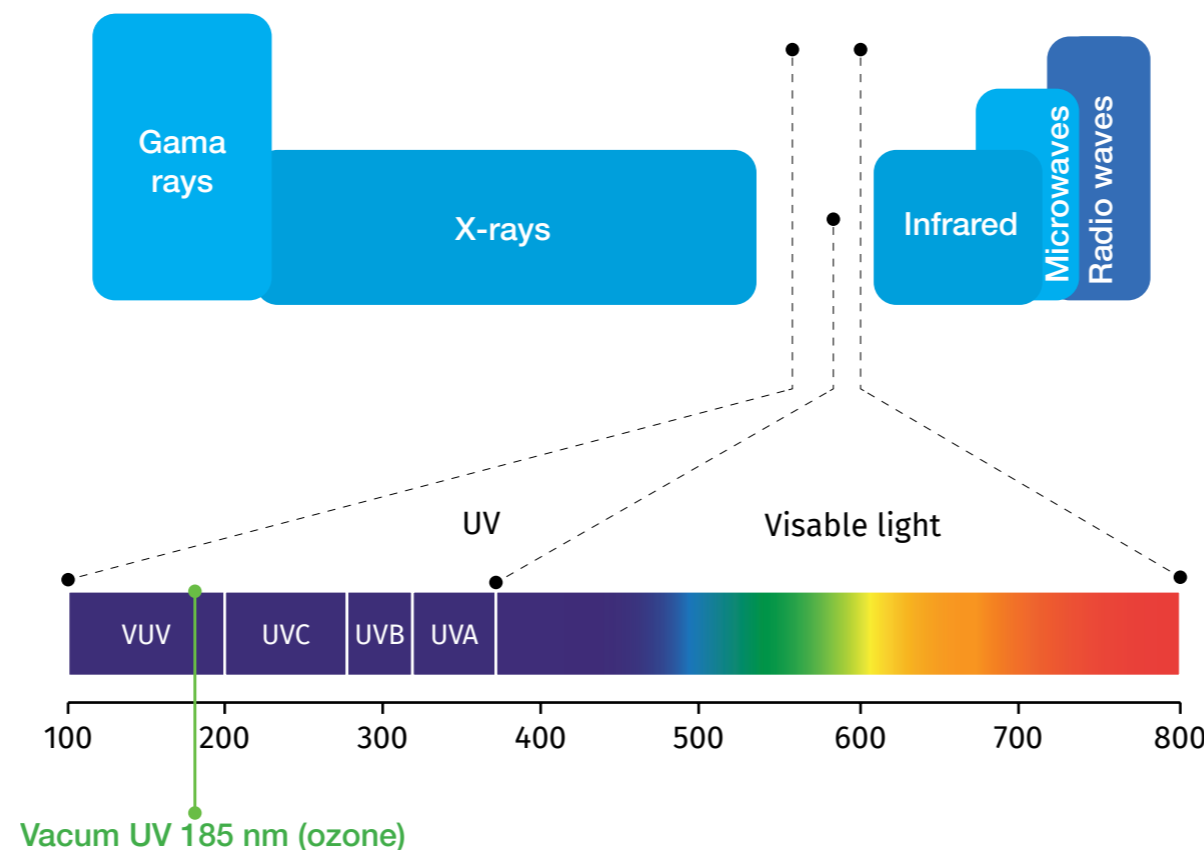
- Effective removal of unpleasant odors from waste air by decomposing odor molecules already in the stage of formation.
- Prevent the deposition of new grease and remove existing deposits in the exhaust system.
- There is no risk of fire due to burning of fat deposits - the best possible protection against fire in professional kitchens.
- Satisfaction of hygiene standards by eliminating a large number of microorganisms.
- Since the unpleasant odor and impurities have been removed it is possible to recirculate the warm air through the system.
- Easy installation, use and maintenance of the system with automated operation.
- Long lifespan of UV lamps - up to 10000 hours with occasional wiping of lamps with denatured alcohol and cloth.
- Quick and easy replacement of UV lamps during service.
- Significantly reduced need for dry cleaning of the exhaust system.
- Numerous security features and warning alarms enable safe operation of the system.
- Longer life of all elements of the exhaust ventilation system due to reduced contamination.
- IMPORTANT: UV ozone purification systems are not intended for use on the charcoal grills

Since UV light radiation is not completely harmless, it is necessary to follow the safety measures listed in the instructions of the manufacturer Klimaoprema.

- The system has several safety elements (magnetic switches and pressure switch) that ensure automatic switching off of UV lamps when removing the grease filter or due to a fault in the exhaust ventilation system.
- In order to make the system as efficient as possible and to completely decompose the remaining ozone, a minimum length of the exhaust ventilation duct of 8m is recommended. It is also recommended to install an FKU filter with activated carbon at the end of the exhaust duct.



- The recommended speed of the exhaust air in the ventilation duct is 2-3m / s, max. 4m / s
- UV lamps are installed directly in the kitchen hood with the mandatory use of flame-retardant filter. On special request, UV lamps can be installed in the exhaust ventilation duct.
- Components of UV Ozone systems and UV lamps are installed exclusively by qualified and specialized personnel, authorized by the manufacturer Klimaoprema.
- Hoods or grease filters equipped with UV lamps must be specially marked. Warning symbol W 09 "Beware of optical beams" in accordance with BGV A8 must be displayed.
- Please read the installation instructions! Standard EN 16282-6 (Commercial kitchen equipment - Part 8: Aerosol treatment plants; Requirements and testing). Annex A 6.4 with notes on UV protection must be highlighted.
- It is advisable to change UV lamps after 10000 hours, since the effect of UV radiation emission decreases over time.
- Once a year, it is necessary to inspect the correct operation of the entire UVC Ozone system.



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+ ACCESSORIES

ORDERING KEY (1) UV Ozone system

UV-C-1

- (1) UV-C-1
- UV-C-2
- UV-C-3
- UV-C-4
- UV-C-6
- UV-C-8

* For more technical information visit www.klimaoprema.com



- ▼ Design principles
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MAINTENANCE

KITCHEN VENTILATION

TRANSPORT

Upon arrival, check the kitchen hood for possible damage during the transport. In case of any damage or shortcomings, immediately contact your supplier.

STORAGE

If the product is not installed immediately:

- Remove any wrapping.
- Protect the product from dust and contamination.
- Do not expose the product to the effects of weather - store it in a dry place.
- Do not store the unit below -20 °C or above 50 °C.

Please properly dispose of packaging material!

MAINTENANCE AND OPERATION

For maintaining the hygiene and fire safety requirements, it is perform periodic cleaning of the kitchen equipment. Cleaning interval is dependent on the type and frequency of use. Soap and dish detergents can be used for cleaning of the surfaces of the hood. Cleaning agents containing chlorine and extremely alkaline solutions (pH>11) should be avoided. KCF filters can be cleaned in the dishwashing machine. UV Ozone system does not require cleaning, and the UV lamps should not be washed with cleaning agents. Supply air plenum can also be inspected by removing the front cover, and cleaned if necessary.

COMMISSIONING

1. Carefully unpack product - be careful of sharp edges and do not use excessive force for unpacking
2. Inspect the product for damage

*** All electric installations and commissioning should be done by a trained electrician!**

Commissioning procedure

1. Ensure that all filters are inserted and free from obstacles
2. Check duct connection
3. Ensure that regulation louvers are open
4. Turn on power supply
5. Turn on supply fans
6. Check device functions
7. Measure if exhaust volume flow is in the required interval
8. Measure if supply volume flow is in the required interval
9. Before commissioning: check the product functions



KITCHEN VENTILATION

Projektiranje, proizvodnja i održavanje opreme za klimatizaciju, ventilaciju i čiste prostore.
Design, production and service of Ventilation, Air-Conditioning and Cleanroom equipment.

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