DES

Kitchen Ventilation Unit

eneko®

Index

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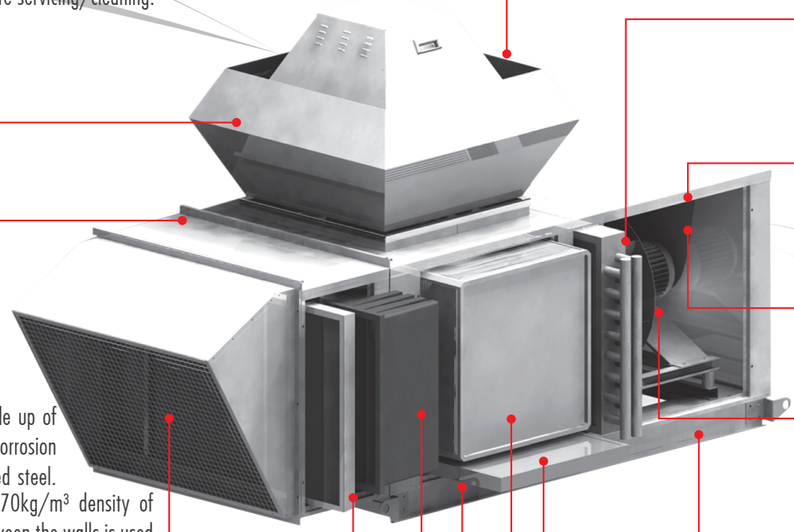
Management System ISO 9001:2008 TÜVRheinland CERTIFIED www.tuv.com ID 9105070369 CE TSEK PG RoHS Conform

eel eneko energylab

The technical specifications and the performance data declared with this logo have been developed by the tests performed in Eneko Energy Laboratory which is established with the development Project support of Tübitak by regarding relevant standards.



Exhaust Air Fan
Discharges the cooking gases delivered by the hood.Backward curved Aluminum centrifugal fans are used in the unit to ensure servicing/cleaning.

Casing
The unit's casing is made up of double skinned high corrosion resistive galvanize coated steel. 50 mm thickness and 70kg/m³ density of Rockwool insulation between the walls is used for thermal and sound insulation. The case of unit is painted by electrostatic powdered paint.

Supply Air Louver
Prevents impurities that enters the system.

Pre-filter
To increase indoor air quality and to protect the equipments used in unit, G class filters (according to EN 779 standard) are used in DES units.

Fine Filter
To remove dust and particles that still exists after pre-filtration, F class bag filters (according to EN 779 standard) are used

Exhaust Discharge
Discharges exhaust air vertically to prevent by-pass to supply air.It protects exhaust fan and motor against external effects.

Heating Coil
After fresh air leaves from heat exchanger,it is heated up to demanded indoor air temperature by heating coil.Water inlet and outlets can be designed at bottom, inside suspended roof. No additional drilling on the roof is required.

Weather Proof Plate
Protects the unit from unfavorable weather conditions (rain etc.)

Electrical and Control Equipment
The unit is designed so that it is easy to start up and make electrical operation.

Supply Air Fan
Backward curved Aluminum centrifugal fans are used in the unit to ensure easy servicing/cleaning.

Roof Curb
Located between the unit and the roof construction and is used as a mounting base. Obtains air tightness on the roof for both exhaust and supply air ducts.

Metal Filter
Holds lubricants in exhaust air. It is made of corrosion resistant aluminum material and washable.

Heat Recovery Exchanger
The Aluminum plate heat recovery exchanger consists of flat Aluminum plates sewed together on the edge.The sewing progress ensures leakage free design.The exchanger is designed so that it is easy to clean.

Drain Pan
It is installed to discharge the drainage water which comes from the heat exchanger. It is made of Stainless Steel.

Applications & Advantages & By-Pass Section

Applications

DES units are used in hotel kitchens, food manufacturing plants, food courts in malls/airports and similar places to exhaust cooking gases while introducing fresh air from outdoors. The units are designed to use with make-up air capable hoods to reduce exhaust air demand and decrease energy consumption due to smaller exhaust air flow rates.

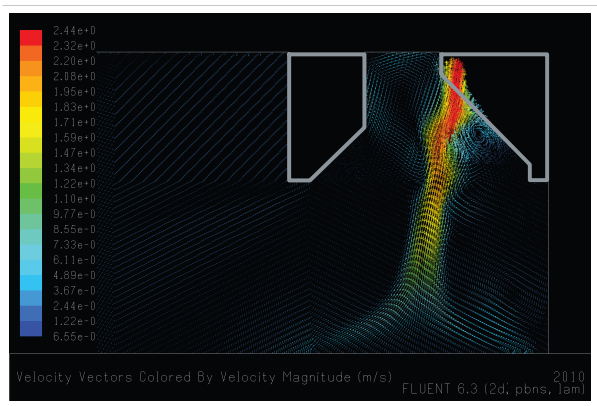
- Hotel Kitchens
- Food Manufacturing Plants
- Food courts in Airports
- Food courts in Malls

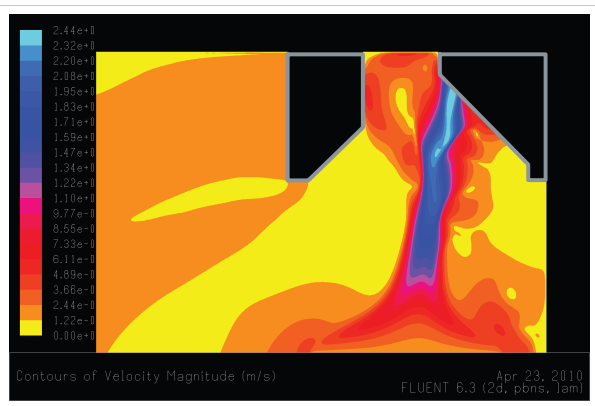
Advantages

- DES units with make-up air hoods, reduces exhausted air flow up to 80% and develop significant energy saving than the traditional hood ventilation systems.
- With heat exchanger,energy is regained from exhaust air
- Exhaust fans,supply fans and whole components including the control are in the same casing, that's why the unit has a compact design.
- Exhaust air stream is not in contact with exhaust motor.
- The unit is designed to work outdoors, that's why it is weather proof.
- Supply air and exhaust air can be controlled via control panel.
- Backward curved Aluminum centrifugal fans are used in the unit.
- The unit consists all electrical and control equipments, that is why it is "Plug and Play".
- With the help of the additional metal filter, unit is protected against fouling.
- Fresh air is filtered with G class synthetic and F class bag filters to increase supply air quality.

By-Pass Section

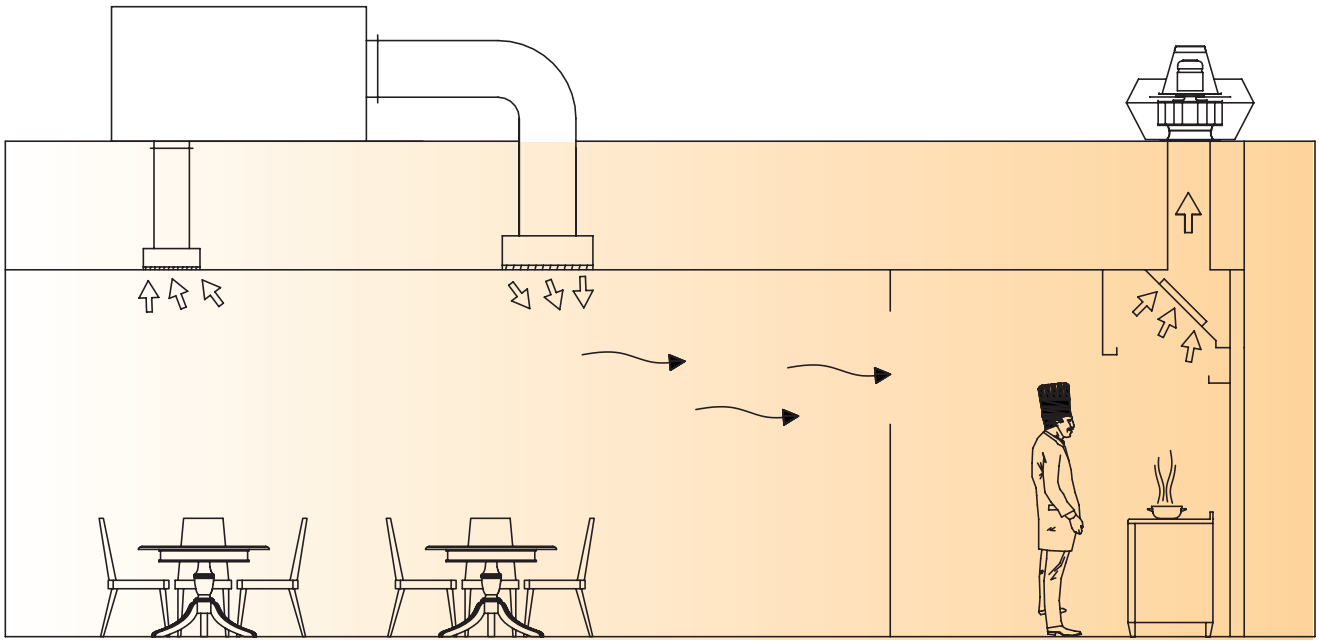
DES 5000 and upper models are designed with by-pass sections to develop free-cooling in summer. When outdoor air temperature exceed 25 °C, by-pass damper is opened and exhaust air from the canopy is extracted without contact with heat recovery exchanger.





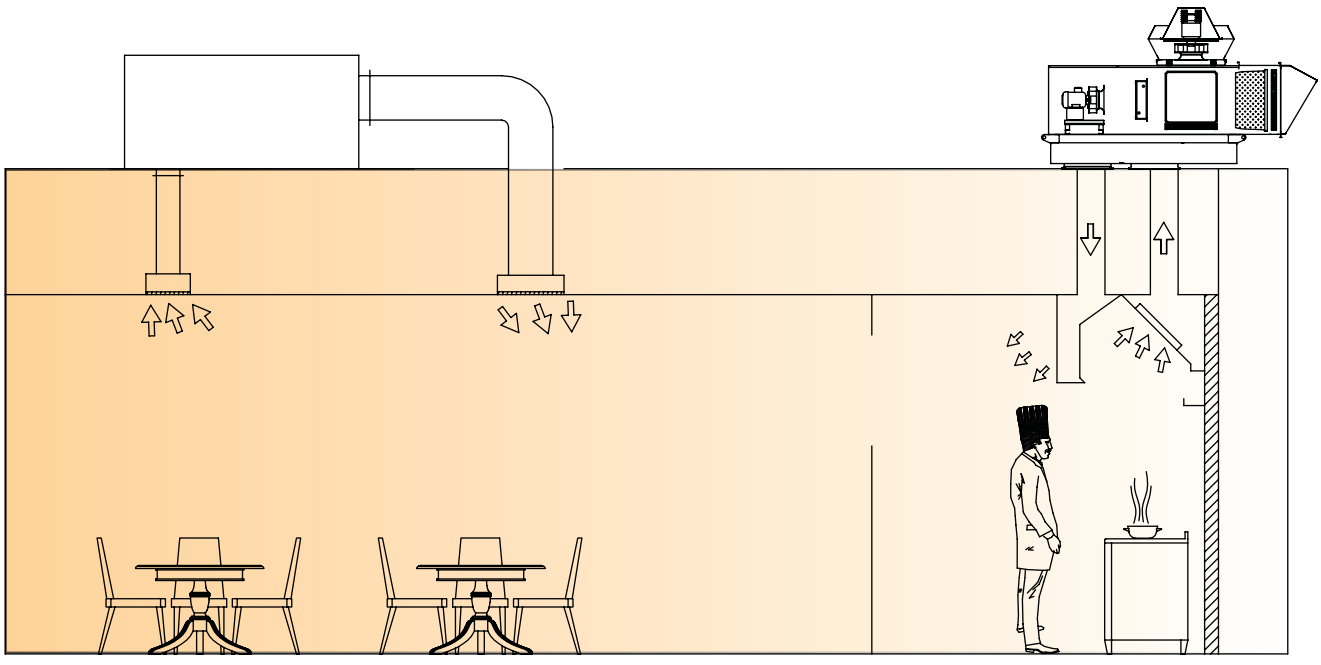
Engineering calculations are vital to simulate fluid characteristic. For complex models it is extremely hard to calculate the characteristics with analytic methods. Instead numerical methods are used to calculate heat transfer, pressure drop and flow velocity during design process to ensure alike behavior of the equipment in operational period. DES units are analyzed to calculate proper amount of fresh air and correct supply points in kitchen spaces with CFD-Computational Fluid Dynamic software.

Traditional kitchen/food court ventilation



Ventilation system exhausts the conditioned air from the kitchen and neighbor areas. As the cooking appliances are not isolated from the kitchen, significant amount of air is exhausted to avoid cooking gas inflation to the kitchen and neighbor areas. For a medium kitchen,exhaust air temperature is 28 °C in summer and 24 °C in winter which results in significant energy losses.

Kitchen/food court ventilation with DES Units



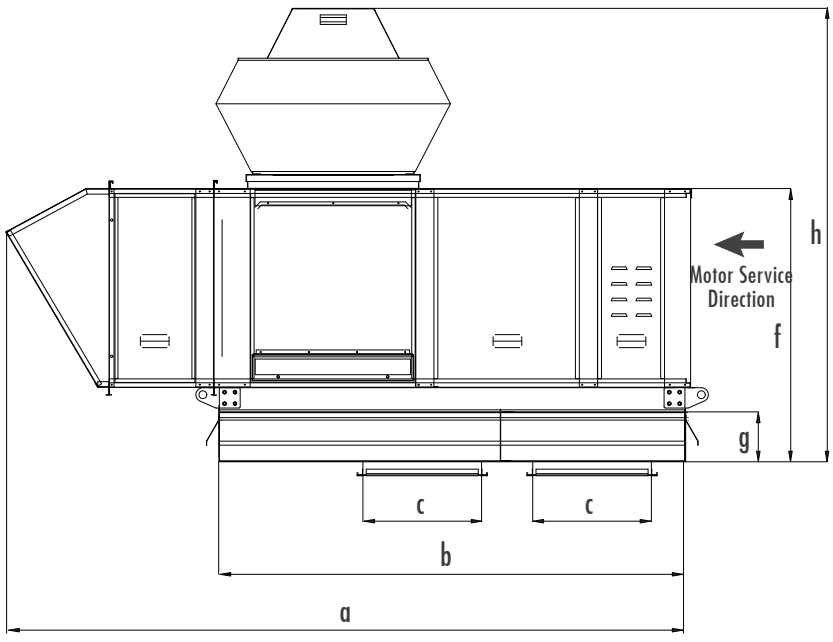
With make-up air hoods;

- The exhaust of conditioned air is prevented.
- Significant amount of exhausted air is met with make-up air and air stability is met.
- Energy consumption for additional motors/pumps etc. is abated.
- Additional air conditioning load in traditional ventilation systems is reduced. (up to 90% according to climate conditions)
- Initial cost of the system is reduced as the heating/cooling equipment in the system is lessened.

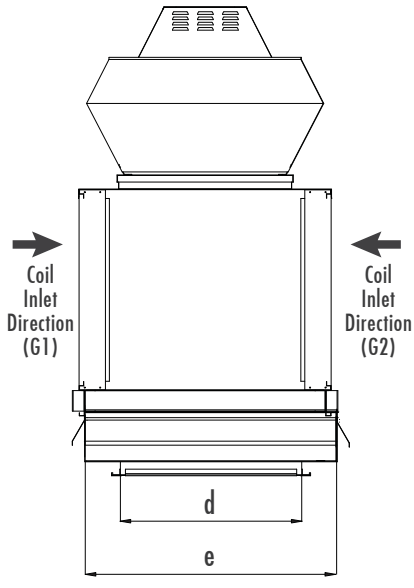
Technical Specifications

DES TECHNICAL SPECIFICATIONS			DES 3500	DES 5000	DES 8000	DES 11000	DES 14000	DES 16000	DES 18000	DES 21000
	Exhaust Air Flow	m^3/h	3500	6000	8000	11000	14000	16000	18000	21000
	Supply Air Flow	m^3/h	2800	5200	6400	9000	11000	12800	14400	16800
	External Static Pressure	Pa	300	340	500	680	370	420	670	630
	Supply Air Ratio	%	Summer / Winter 100							
	Exhaust Air Fan Motor Power	kW/rpm	1.1/1500	2.2/1500	3/1500	5.5/1500	5.5/1500	2x3/1500	2x5.5/1500	2x5.5/1500
	Supply Air Fan Motor Power	kW/rpm	1.1/1500	2.2/1500	2.2/1500	3/1500	5.5/1500	2x3/1500	2x3/1500	2x3/1500
	Frequency Convertor	kW	1.1	2x2.2	1x3 / 1x2.2	1x5.5 / 1x3	2x5.5	2x7.5	1x11 / 1x7.5	1x11 / 1x7.5
	By-Pass Damper		-	On/Off Control						
	Heat Recovery		Aluminium Plate							
	Heating Coil	Kcal/h °C	24000 90/70	44000 90/70	55000 90/70	77000 90/70	86000 90/70	99000 90/70	106000 90/70	127000 90/70
	Unit Weight	kg	420	620	725	810	930	1100	1125	1250

Unit Dimensions



*Front View

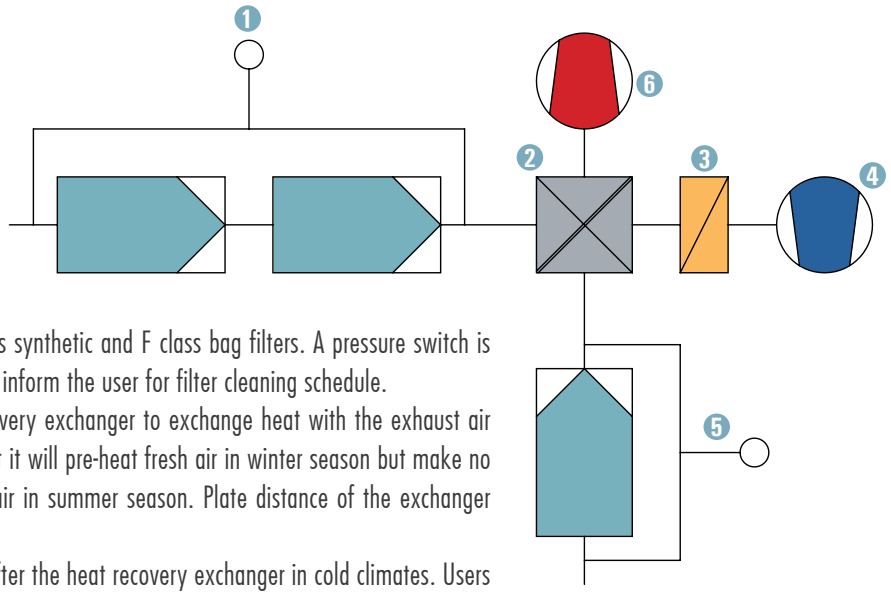


*Side View

	a	b	cxd	e	f	g	h	x	y	Coil Inlet Direction
DES 3500	2632	1790	450x450	910	1050	200	1750	900	1000	G1 Air Flow Direction Right
DES 5000	2955	2010	700x400	1300	1275	200	2100	900	1000	G1 Air Flow Direction Right
DES 8000	3165	2220	500x1000	1900	1275	200	2210	1100	1000	G2 Air Flow Direction Left
DES 11000	3165	2220	500x1000	1900	1275	200	2210	1100	1000	G2 Air Flow Direction Left
DES 14000	3165	2220	500x1000	1900	1275	200	2210	1100	1000	G2 Air Flow Direction Left
DES 16000	3350	2310	500x1300	2100	1470	200	2380	1600	1000	G1 Air Flow Direction Right
DES 18000	3350	2310	500x1300	2100	1470	200	2380	1600	1000	G1 Air Flow Direction Right
DES 21000	3350	2310	500x1600	2375	1470	200	2380	1900	1000	G2 Air Flow Direction Left

All measurement values are mm.

x: Minimum service space for both side of the unit.
y: Minimum service space for back of the unit.



1. Fresh air is taken from outdoor and filtered in G class synthetic and F class bag filters. A pressure switch is located in the unit to monitor filter pressure drop and inform the user for filter cleaning schedule.
2. After filtration, fresh air is delivered to the heat recovery exchanger to exchange heat with the exhaust air stream. The exchanger is designed in such a way that it will pre-heat fresh air in winter season but make no significant changes in the temperature of the fresh air in summer season. Plate distance of the exchanger ensures easy maintenance to the unit.
3. Fresh air temperature is regulated with heating coil after the heat recovery exchanger in cold climates. Users in the kitchen demands hot air blown inside to obtain operable temperature gradient. To control air outlet after the heating coil 3 way valves are optionally available.
4. Fresh air is introduced to the kitchen space after filtration and conditioning. Belt/Pulley free design fans are controlled with Frequency Control system and delivers right amount of fresh air to the system.
5. After gathering the cooking gases by the hood, exhaust air is delivered to the unit and filtered by the metal filter inside the unit. Although existing metal filters in the hood to preserve the unit additional metal filter is designed. A pressure switch is located in the unit to monitor filter pressure drop and inform the user for filter cleaning schedule.
6. Filtered air is introduced to the heat recovery exchanger and exchanges energy with fresh air. Then it is blown vertically by the exhaust discharge. Exhaust fan motor is located in a sealed box to prevent contact with exhaust air.

Control

To obtain operation in design conditions, below listed control systems and equipments are delivered with the unit.

1- Fresh Air and Exhaust Air Frequency Control:

Controls fresh and exhaust air flow. For the model DES 3500, there is one frequency convertor only for supply air fan. For the models DES 5000 and upper, frequency convertor is used for both supply and exhaust air fan.Hood area, structure, installation, grease filters, duct length and fittings can result in different operation conditions of the unit. While commissioning of the system, air flow speed is measured and fresh air flow shall be adjusted.

2- Fresh Air Pressure Switch (Optional)

Filter cleaning demand is informed to the user.

3- Exhaust Air Pressure Switch (Optional)

Filter cleaning demand is informed to the user.

4- Unit Alarm

If any problem occurs in exhaust and/or supply fan, user is informed.

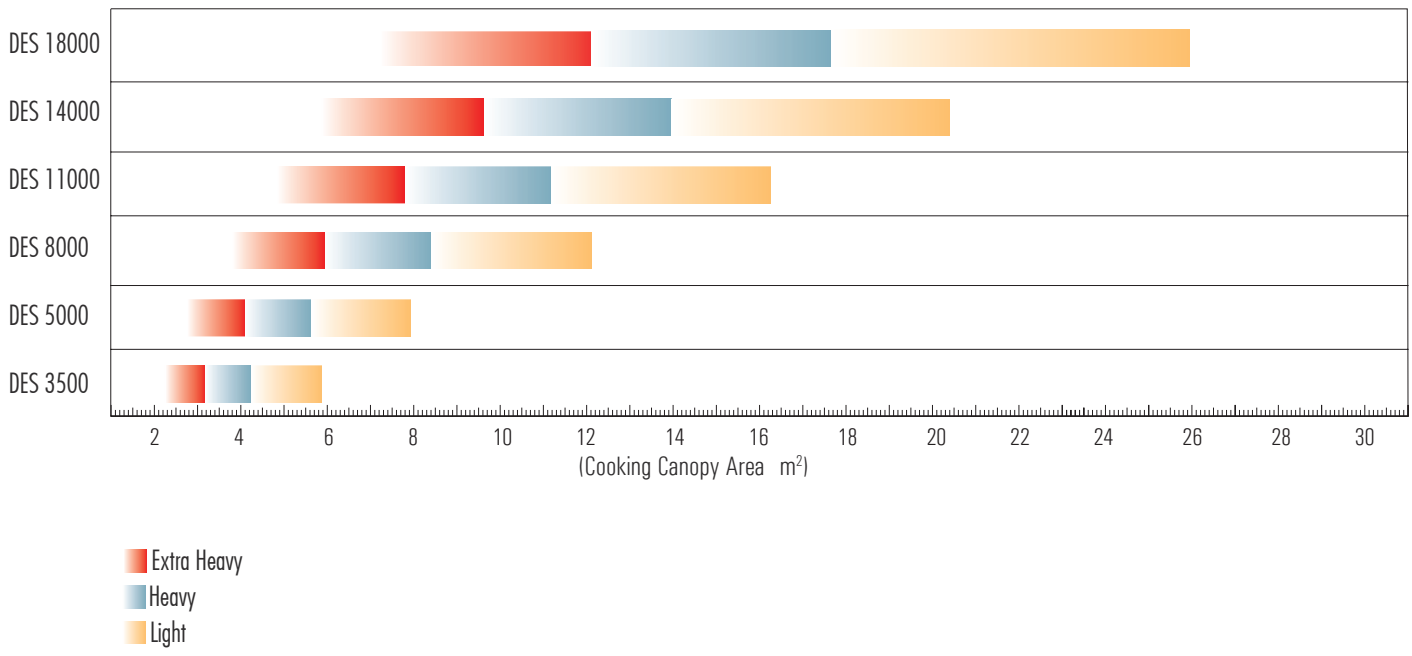
Unit Selection

Eneko Kitchen Ventilation units are used to introduce calculated amount of fresh air and remove cooking gases from make up air canopies.

Unit selection,therefore, shall be made according to design criteria.
In ventilation literature kitchens are classified in 3 groups, Light Kitchen, Heavy Kitchen and Extra Heavy Kitchen.

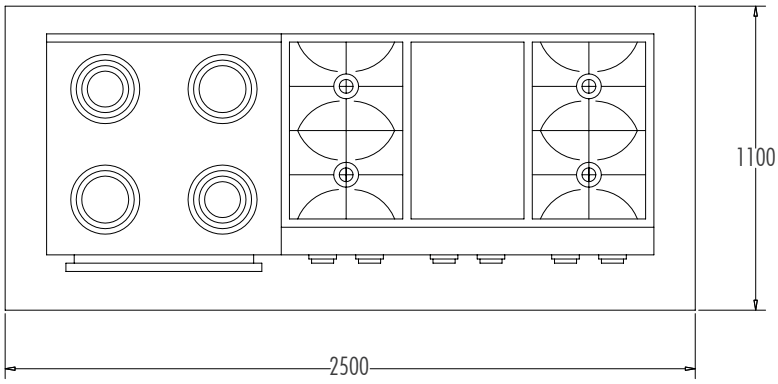
Kitchen Types	Light	Heavy	Extra Heavy
Cooking Appliances	Gas Fired/Electrical Ovens Vapor cookers Gas Fired/Electrical Burner Bakery Pasta Cookers	Gas Fired/Electrical Fryers Gas Fired/Electrical Grids Pizza Ovens	Pans Charcoal Burners

DES units can be selected according to the appliances and the cooking canopy area in below diagram.



Selection Sample

Sample 1



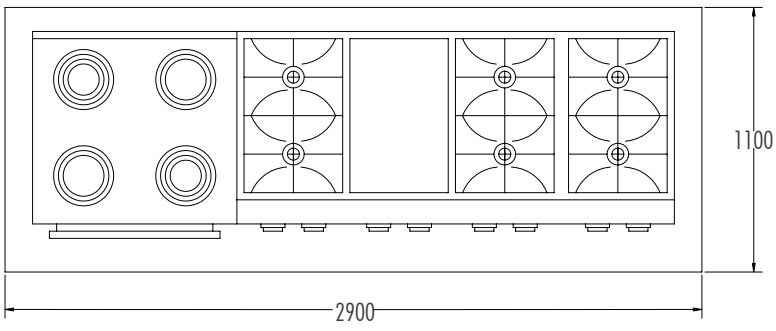
DES 3500 unit will be suitable for the application.

A canopy with 2,5 x 1,1 m dimensions will be applied to an Extra Heavy kitchen. Which unit shall be installed for the application.

Selection

Area : 2,5 x 1,1 = 2,75 m2
Type : Extra Heavy

Sample 2



A canopy with 2,9 x 1,1 m dimensions will be applied to an Extra Heavy kitchen. Which unit shall be installed for the application.

Selection

Area :2,9 x 1,1 = 3,2 m2
Type : Extra Heavy

Evaluating these data both DES 3500 and DES 5000 units can ben applied to the system. The designer should consider the intensity for the kitchen. For this case gas burner appliances with intense usage will be used, that is why the designer should select DES 5000.

Versions

1 - Standard Version

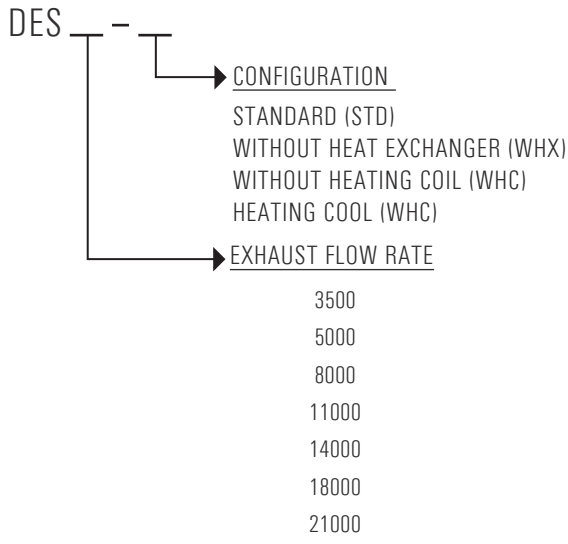
DES units in basic models include exhaust and supply air fans, exhaust and supply air filters, heat recovery exchanger and heating coil. Heat recovery exchanger plate distance is high against fouling of the heat exchanger. Only 45% of the heat is transferred to fresh air as a result of high plate distance.

2 - WHX, Without Heat Exchanger

Heat Recovery exchanger recovers significant amount of heat in cold climates but in warmer climates the heat recovery is reduced due to small temperature distances between supply and exhaust air. In applications where the climate is warm, DES units can be supplied without the heat recovery section.

3 - WHC,Without Heating Coil

In hot and warm climates only heat recovery exchanger may be enough to pre-condition fresh air. In these applications heating coil can be dismissed within the unit.



Automation Options		Control Cards			
Standard	Optional	Standard			Alternative
		Type 1	Type 2	Type 3	
OA Temperature Sensor		✓	✓	✓	✓
RA Temperature Sensor		✓	✓	✓	✓
SA Fan Control		✓	✓	✓	✓
RA Fan Control		✓	✓	✓	✓
ByPass Damper		✓	✓	✓	✓
SA Temperature Sensor		✓	✓	✓	✓
Modbus RTU		✓	✓	✓	✓
Filter Contamination Info (DPS)		✓	✓	✓	✓
Weekly Timer		✓	✓	✓	✓
	On/Off Damper Control	✓	✓	✓	✓
	Proportional Damper Control	✓	✓	✓	✓
	Airflow Control	≡	✓	≡	✓
	Humidity Control		✓		✓
	CO2 Control		✓		✓
	On/Off Heating Coil	✓	✓	✓	✓
	Proportional Heating Coil	✓	✓	✓	✓
	On/off Cooling Coil	✓	✓	✓	✓
	Proportional Cooling Coil	✓	✓	✓	✓
	Electrical Pre-Heater	✓	✓	✓	✓
	Electrical After-Heater	✓	✓	✓	✓
	BacNET MSTP	✓	✓	✓	✓
	Web Browser (TCP/IP)	✗	✓	✗	✓

≡ Only one of them of defined functions is selectable for this control card.

Control Panel			Control Cards			
Panel Type		Panel Descriptions	Standard			Alternative
			Type 1	Type 2	Type 3	
	Standard-1.1	Wall-mounted type room panel, IP 30 protection class, Max:700 m communication ability	✗	✗	✓	✗
	Standard-1.2	**Hand Panel 1:** Wall-mounted type, IP 65 protection class for only front side of panel, Max:50 m communication ability **Hand Panel 2:** Magnet type, IP 65 protection class for whole panel, Max:50 m communication ability	✓	✓	✓	✗
	Standard-1.3	Magnet type, IP 31 protection class, Max:700 m communication ability	✓	✓	✓	✗
	Alternative	Wall-mounted type hand panel, IP 30 protection class, Max:100 m communication ability	✗	✗	✗	✓

General Terms and Conditions of Sale

GENERAL

The sale of all Products of ENEKO shall exclusively be made on the basis of these General Terms and Conditions of Sales. Any other conditions and General Conditions of Purchase of the Buyer are not accepted.

OFFERS

Our offers are non-binding and without obligation. Contracts for delivery and all other agreements (including subsidiary agreements) as well as declarations of our representatives shall only become legally binding for us after written confirmation. We do not render planning service. Proposals made and information provided by our representatives shall be non-binding. Illustrations, drawings, dimensions and weights or other performance data shall only be binding if this is expressly agreed in writing.

TERMS OF ORDER

Purchase orders shall be sent to ENEKO in written form and shall be non-binding unless they are accepted by written confirmation (order confirmation) from ENEKO. Each order shall include properly identified Products ordered and relevant shipping dates.

PRICE OF THE GOODS

Prices are net Ex Works according to current Incoterms unless stated otherwise and do not include any kind of taxes.Prices are valid at the date of delivery will be applied.We reserve the right to adjust prices for confirmed orders as well to reflect any increase in our costs for any reason beyond our control like force majeure, shortage of primary material or labor strikes, official orders, transportation or similar problems.In this case, a new price agreement shall be required for higher rates. If such an agreement is not made, we shall be entitled to withdraw from the contract by written notice within 15 days.

TERMS OF PAYMENT

Payments shall be carried out according to the contractual terms as defined and set forth in the order confirmation. If the payment conditions have not been agreed upon conclusion of the contract, the payment terms and payment dates specified in our invoices shall be binding. Deadlines for discounts and periods allowed for payment shall begin to run upon receipt of the invoice. Payments by draft, bills of Exchange or anyway extended payments shall mean neither credit novation, nor prejudice to the Retention of Title agreement, nor to territorial competence.If buyer fails to make payment by due date, we are entitled to charge the buyer with a relevant interest on the unpaid amount.

TERMS OF DELIVERY

Delivery time information is only approximate. We shall only be in default if the performance is due and a written demand for payment was issued. Delivery day is the day of dispatch Ex Works.We shall also not be liable with regard to bindingly agreed periods and dates in the event of delays an delivery and of performance due to force majeure and events which considerably complicate or make delivery impossible not only temporarily-strike lockout, breakdown, delay in supply with important raw and auxiliary materials even if the delay occurs at our supplier, in particular. These delays entitle us to postpone delivery for the period of the impediment plus a reasonable start-up period or to withdraw from the contract as a whole or in part.If delivery time is extended or we are released from our delivery commitment, the buyer may not derive a claim for damages from it. However, we may only rely on the circumstances mentioned if we notify the buyer immediately.We shall be entitled to make part deliveries. Any part delivery shall be considered as independent transaction.In case of default, our liability is limited to contract-typical foreseeable damage.

SHIPMENT

Shipment is made for the buyer's account.Mode of shipment and shipping route, transport and packaging and other securities respectively shall be at our choice. We shall be entitled, however, not obliged to insure deliveries in the name and for account of the buyer.Risk passes to the buyer when shipment is handed over to the person performing the transport or left our Works for shipment. If shipment is delayed upon buyer's request, risk passes to the buyer with the ready for shipment note.If ordered goods are rejected after the ready for shipment note, we shall be entitled to request payment and store the goods at buyer's expense.Discharge of the goods is made at buyer's expense.

RETENTION OF TITLE

In any event ENEKO shall retain full ownership of all materials supplied whilst the payment conditions of the entire amount have not been complied with, said materials may be removed from the customer at our request. Should the customer be declared bankrupt or insolvent and has not made paid the entire amount of payments. ENEKO shall be entitled to recover the goods. ENEKO may interrupt the supply without incurring any liability whatsoever if he had notice of or became aware of a decrease in the creditworthiness of the purchaser or if any of the existing negotiable instruments or debts were not properly complied with, shall result as being unpaid and protested.

WARRANTY

ENEKO Products are under warranty (defect in material or workmanship)for 2 years from the date of sale reflected on the invoice. Under this warranty, ENEKO is under the obligation to replace the part requested under warranty.

The followings are excluded from ENEKO warranty:

- Normal wear and tear
- Defective assembly or handling
- Third party compensation

Parts the subject of a claim shall be sent to our warehouse as carriage paid with relevant report completely filled in, wherein the parts shall be subjected to analysis.

LIABILITY

ENEKO, for any losses/damages, shall only be responsible within the limits of the law.Owing to basic obligations undertaken by simple negligence, if the contract is violated, ENEKO's liability shall be limited to compensate for losses which are emerged specific and predictable. ENEKO shall not carry any responsibility in case of a single negligence in breach of non-essential contractual obligations.

PROPERTY RIGHTS

The purchaser in no event and under no circumstances whatsoever shall publish or use the trademark, trade name or logo of ENEKO without a prior written permission.

GOVERNING LAW AND JURISDICTION

This agreement shall be governed with all aspects of the Turkish Law.The courts of Izmir/Turkey shall have an exclusive jurisdiction to adjudicate any dispute arising under or in connection with this agreement.

Notes

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